Reindeer Wellhead Platform and Gas Supply Pipeline

Operations and Cessation of Production Environment Plan WA-41-L and WA-18-PL

September 2024

Document No.: 7715-650-EMP-0023

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Project / Facility	Reindeer Wellhead Platform and Pipeline
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Rev	**Owner**	**Reviewer(s)**	**Approver**
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Rev	Rev Date	Author / Editor	Amendment
6	12/09/2024	Santos WA	Issued to NOPSEMA
5A	TBA	Santos WA	Revision A draft five-year revision issued for internal review
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4A	May 2020	Santos WA	Addressed comments from NOPSEMA on RFFWI date 5 May 2020, issued for Santos review. Note: material deleted text will appear as ~~highlighted strikethrough~~ all new text appears as highlighted text.
4	6/04/2020	Santos WA	Issued to NOPSEMA
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3	17/12/19	Santos WA	Issued to NOPSEMA
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2	16/07/19	Santos WA	Issued to NOPSEMA
1.3B	13/06/19	Santos WA	Revision B draft five-year revision issued for internal review
1.3A	13/05/19	Santos WA	Revision A draft five-year revision issued for internal review
1.3	07/09/2016	Quadrant Energy	Update to Section 5.3 (atmospheric emissions) and Table 7-3 to accurately describe the potential sources and measurement of atmospheric emissions from Reindeer WHP (risk assessed in MOC-155).
1.2	08/07/2015	Quadrant Energy	Revised to incorporate MoC-95
1.1	05/08/2014	Quadrant Energy	Revised to incorporate MoC-056, which includes content of RFFWI accepted by NOPSEMA (31/07/14)
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0	11/09/2013	Quadrant Energy	Submission to NOPSEMA
A	06/09/2013	Quadrant Energy	Draft issued for internal review

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Terms

Term	Definition
ABARES	Australian Bureau of Agricultural and Resource Economics
AFMA	Australian Fisheries Management Authority
ALARP	As low as reasonably practicable
AMOSC	Australian Marine Oil Spill Centre
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZG	Australian and New Zealand Guidelines
APPEA	Australian Petroleum Production and Exploration Association
AUV	Autonomous Underwater Vehicle
BIA	Biologically Important Area
CAMBA	China Australia Migratory Bird Agreement (1986)
CCS	Carbon capture and storage
CH_4	Methane
CMMS	Computerised Maintenance Management System
CO_2	Carbon Dioxide
CSB	Commonwealth State Boundary
CTD	Conductivity, Temperature and Depth
DAFF	Department of Agriculture, Fisheries and Forestry (Commonwealth)
DAH	Dissolved Aromatic Hydrocarbon
DAWR	Department of Agriculture and Water Resources
DBCA	Department of Biodiversity, Conservation and Attractions (formerly Department of Parks and Wildlife)
DC	Devil Creek
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCGP	Devil Creek Gas Plant
DEH	Department of Environment and Heritage
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DEWHA	Department of the Environment, Water, Heritage and the Arts, now Department of Climate Change, Energy, the Environment and Water (DCCEEW)
DoEE	Department of the Environment and Energy (now DCCEEW)
DoF	Department of Fisheries (now DPIRD)
DoT	Department of Transport
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industry and Regional Development (formerly Department of Fisheries)
DWER	Department of Water and Environmental Regulation
EMBA	Environment That May Be Affected
EP	Environment Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPO	Environmental Performance Outcome
EPS	Environmental Performance Standard
ESD	Emergency Shutdown
GDA	Geocentric Datum of Australia

Term	Definition
GHG	Greenhouse Gas
H_2S	Hydrogen Sulphide
HDD	Horizontal Directional Drilling
HSE	Health, Safety and Environment
Hz	Hertz
IAPP	International Air Pollution Prevention
IMO	International Maritime Organisation
IMS	Invasive Marine Species
IMT	Incident Management Team
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Birds Agreement (1974)
KEF	Key Ecological Feature
kHz	Kilohertz
km	Kilometre
KP	Kilometre Point
L	Litre
LAT	Lowest Astronomical Tide
m	Metre
m/s	Metre per second
m^2	Square metre
m^3	Cubic metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-Beam Echo Sounder
MNES	Matters of National Environmental Significance
MoC	Management of Change
MODU	Mobile Offshore Drilling Unit
MOP	Marine Oil Pollution
MPNMP	Marine Parks Network Management Plan
nm	Nautical mile
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NOx	Nitrogen Oxides
NRT	National Response Team
NT	Northern Territory
OPEP	Oil Pollution Emergency Plan
OPGGS Act	Offshore Petroleum and Greenhouse Gas Storage Act 2006
OPGGS(E)R 2023	Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023
OSRL	Oil Spill Response Limited
ppb	Parts per billion
ppm	Parts per million
ROTV	Remotely Operated (underwater) Towed Vehicle
ROV	Remotely Operated (underwater) Vehicle
SA	South Australia

Term	Definition
SBES	Single-Beam Echo Sounder
SBP	Sub Bottom Profiler
SMPEP	Shipboard Marine Pollution Emergency Plan
SOLAS	Convention on Safety of Life at Sea, 1974
SOPEP	Shipboard Oil Pollution Emergency Plan
SO_x	Sulphur Oxides
SSS	Side-Scan Sonar
UAV	Unmanned Aerial Vehicle
UNCLOS	United Nations Convention on the Law of the Sea (1982)
VOC	Volatile Organic Compound
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council
WHP	Wellhead Platform
WOMP	Well Operations Management Plan
µm	Micrometre or Micron
µPa	Micropascal

1. Introduction

1.1 EP summary

OPGGS(E)R 2023 Requirements
Regulation 35(6)
Within 10 days after receiving notice that NOPSEMA has accepted an environment plan (whether in full, in part or subject to limitations or conditions), the titleholder must submit a summary of the accepted plan to NOPSEMA for public disclosure.
Regulation 35(7)
The summary: a) must include the following material from the environment plan for the activity: (i) the location of the activity; (ii) a description of the receiving environment; (iii) a description of the activity; (iv) details of environmental impacts and risks of the activity; (v) a summary of the control measures for the activity; (vi) a summary of the arrangements for ongoing monitoring of the titleholder's environmental performance; (vii) a summary of the response arrangements in the oil pollution emergency plan; (viii) details of consultation already undertaken, and plans for ongoing consultation; (ix) details of the titleholder's nominated liaison person for the activity; and b) must be to the satisfaction of NOPSEMA.

A summary of the accepted plan is provided in Table 1-1 as per Regulation 35(6)(7) of the Offshore Petroleum and Greenhouse Gas (Environment) Regulations 2023 (OPGGS(E)R), drawing on the information contained in this EP.

Table 1-1: Environment Plan Summary

Environment Plan (EP) Summary material requirement	Relevant section of EP containing EP Summary material
The location of the activity	Section 2.1
A description of the receiving environment	Section 2.11 and Appendix C
A description of the activity	Section 2
Details of the environmental impacts and risks	Sections 6 and 7
The control measures for the activity	Sections 6 and 7 and Table 8-2
The arrangements for ongoing monitoring of the titleholder's environmental performance	Section 8
The response arrangements in the oil pollution emergency plan (OPEP)	Section 6.7 and OPEP
Details of consultation already undertaken and plans for ongoing consultation	Section 4
Details of the titleholder's nominated liaison person for the activity	Section 1.6.2

1.2 Background

Santos WA Northwest Pty Ltd (Santos) on behalf of Santos Offshore Pty Ltd operates Reindeer wellhead platform (WHP) and associated wells within permit area WA-14-L and the offshore section of the Devil Creek Gas Supply Pipeline (DC supply pipeline; WA-18-PL) in Commonwealth waters.

The infrastructure on title is collectively referred to as the Reindeer facilities which comprise:

- The WHP infrastructure, ~80 km offshore north-west of Dampier
- An offshore section of the DC supply pipeline in Commonwealth waters, ~43 km long (from kilometre point (KP) 91.27 at the WHP to KP48.3 where the DC supply pipeline crosses into State waters)
- Three wells tied back to the WHP

- An open ocean well (Reindeer-1) that is temporarily abandoned and not connected to the WHP.

Two open ocean wells (GNU-1 and Caribou-1/Caribou -1 RE re-entry) are located within WA-41-PL, which were historical exploration wells, are both permanently plugged and abandoned with all casing and strings removed below the mudline. The wellheads have also been removed. As such, they are not a petroleum activity, do not form part of the scope of the EP and are not discussed further within this EP, other than to have their location and status on title, listed in Table 2-1. Santos confirms that its records match the information that can be obtained from the National Offshore Petroleum Titles Administrator (NOPTA) administered National Offshore Petroleum Information Management Systems (NOPIMS) database.

Although the offshore Reindeer facilities are associated with the operation of the Devil Creek Gas Plant (DCGP) and the portion of the DC supply pipeline that is in State waters, this infrastructure is outside of the scope of this EP and is managed under the Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations EP (EA-14-RI-10001/01) and Devil Creek Operations Environmental Management Plan (DC-40-RI-00021), respectively, under WA State jurisdiction.

1.2.1 Transition to preservation

The Reindeer field is approaching the end of its economically viable production life and is expected to cease production in late 2024 or early 2025. As part of the five-year revision, this EP has been updated to include cessation of production (CoP) and preservation activities. The CoP phase commences when the facility reaches its end of field life and has been shut-in and depressurised. The DC supply pipeline and WHP are then cleaned and flushed of residual hydrocarbons and left in a preserved state for future phases (Section 2.10).

Cleaning and flushing of the DC supply pipeline and WHP for CoP phase purposes will be undertaken under this EP revision once accepted.

In anticipation of the CoP, Santos is assessing options to either decommission the Reindeer facilities or repurpose the facilities for other activities. Carbon capture and storage (CCS) is currently under assessment as a reuse option, which would involve transport of carbon dioxide (CO_2) from onshore third party sources to the Reindeer field for reinjection into the wells. Further details on re purposing options are provided in Section 2.12.

The Reindeer facilities will remain in place ‘preserved’ during the CoP phase that will continue until a decision on re-purposing or field decommissioning occurs. Any future use of the facility for other activities or decommissioning are not included in the scope of this EP and will be covered in future EPs. Section 2.13 provides additional information on the planning for these activities.

1.3 Scope of this Environment Plan

The activities that may be undertaken under this revised EP, include the following:

- Operations phase:
  - Presence of infrastructure on title
  - Operation of the wellhead platform, wells and DC supply pipeline
  - Transporting unprocessed condensate from the Reindeer field to DCGP
  - Vessel based activities associated with operations; and
  - IMMR activities described below may also be undertaken during the operations phase.
- CoP (preservation) phase:
  - Commences the facility reached end of field life and is shut in and depressurised
  - The facilities are cleaned and flushed to remove hydrocarbons and contaminants
  - The facilities are then preserved using treated seawater or inert gas such as nitrogen
  - The Reindeer facilities will remain in preservation phase until a decision is made to either repurpose the facilities or decommission all, or part of the facilities; and
  - IMMR activities described below may also be undertaken during the preservation phase to maintain the integrity of the facilities.
- Inspection, maintenance, monitoring and repair (IMMR) may be undertaken during the operations phase or CoP phase and includes activities such as:
  - Subsea and DC supply pipeline integrity and corrosion management

- – Flushing and cleaning of infrastructure and DC supply pipeline
- – Subsea, pipeline and seafloor imaging surveys
- – Subsea, pipeline and seafloor visual and sampling surveys
- – Plant inspection, maintenance and modifications
- – Well intervention, temporary abandonment or suspension
- – Bird deterrence on the WHP.

1.4 Purpose of this environment plan

OPGGS(E)R 2023 Requirements
Regulation 41(1)
A titleholder must submit a revised environment plan under section 26 for an activity under the title at least 14 days before the end of each consecutive period of 5 years, with the first period commencing on the latest of the following: a) the day an environment plan for the activity is first accepted by NOPSEMA under section 33; b) if a revised environment plan submitted in accordance with this section is accepted by NOPSEMA under section 33—the last day on which such a revised environment plan is accepted; c) if NOPSEMA gives the titleholder a notice under subsection (2) of this section—the day specified in the notice.
Regulation 41(2)
If the titleholder submits a revised environment plan in accordance with section 38, 39 or 40, NOPSEMA may notify the titleholder that the period of 5 years mentioned in subsection (1) of this section starts on a day specified in the notice. The day must be later than the last day to which paragraph (1)(a) or (b) applies.

The operation of the Reindeer facilities has been managed under the Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations Environment Plan (EA-14-RI-10002), originally accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) on 31 July 2014. A subsequent revision to this EP was approved on 9 July 2020 (RMS ID 4917).

The five-year period of the current in-force EP before revision is required under Section 41 of the OPGGS(E)R expires on 09 July 2025, therefore Santos has revised the EP in accordance with Regulation 41 of the OPGGS(E)R 2023 and included additional CoP activities as described in Section 2.10.

This revision has been informed by NOPSEMA's information paper, Considerations for Five-Year Environment Plan Revisions (N-04750-IP1764) and the following NOPSEMA decommissioning policies and guidance:

- Section 572 Maintenance and Removal of Property Policy (N-00500-PL1903 A720369)
- Planning for Proactive Decommissioning information paper (N-00500-IP2002 A816565)
- NOPSEMA policy Section 270 Consent to surrender title – NOPSEMA advice (N-00500-PL1959 A800981).

This EP details the environmental impacts and risks associated with the activities and demonstrates how these will be reduced to as low as reasonably practicable (ALARP) and to an acceptable level. The EP reflects the updated Santos implementation strategy, used to measure and report on environmental performance during planned activities and unplanned events, to ensure impacts and risks are continuously reduced to ALARP and are at an acceptable level. The environmental management of the activity described in the EP complies with the Environmental Health and Safety Policy (Appendix A) and with all relevant legislation. This EP documents and considers all relevant stakeholder consultation.

1.5 Environment plan validity

In accordance with Regulation 41, this EP remains valid from NOPSEMA acceptance until NOPSEMA has accepted an end-of-activity notification under Regulation 46, or until Santos revises this EP in the event a significant change to the activity or level of impact or risk occurs as required under Sub regulation 39 or at the end of a five year period as required under Regulation 41.

Santos may revise the EP, using the MOC Process described in Section 8, any changes made under this process will not affect the validity of this EP.

1.6 Titleholder

1.6.1 Details for the titleholder

OPGGS(E)R 2023 Requirements
Regulation 23(1)
The environment plan must include the following details for the titleholder: a) name; b) business address; c) telephone number (if any); d) fax number (if any); e) email address (if any); f) if the titleholder is a body corporate that has an ACN (within the meaning of the *Corporations Act 2001*)—ACN.
Regulation 23(2)
The environment plan must also include the following details for the titleholder's nominated liaison for the activity: a) name; b) business address; c) telephone number (if any); d) fax number (if any); e) email address (if any).

Santos WA Northwest Pty Ltd (Operator) and Santos Offshore Pty Ltd are the nominated titleholders for the petroleum activity covered under this EP within WA-41-L and WA-18-PL.Table 1-2 lists the two titleholders and their contact details.

Table 1-2: Titleholder details for WA-41-L and WA-18-PL

Permit	Titleholder	ACN	% Interest	Address
WA-41-L	Santos WA Northwest Pty Ltd (Operator)	009 140 854	55	Level 7, 100 St Georges Terrace, Perth WA 6000
	Santos Offshore Pty Ltd	005 475 589	45	
WA-18-PL	Santos WA Northwest Pty Ltd (Operator)	009 140 854	55	
	Santos Offshore Pty Ltd	005 475 589	45	

1.6.2 Details for Nominated Liaison Person

Details for the Santos Nominated liaison person for the activity are as follows:

Name: Dawn MacInnes

Position: Environment Manager WANTTL

Address: 100 St Georges Terrace, Perth WA 6000

Telephone number: (08) 6218 7100

Email address: offshore.environment.admin@santos.com

1.6.3 Notification procedure in the event of changed details

In the event there is a change in the titleholder, the titleholder's nominated liaison person or change in the contact details for the titleholder or liaison person, Santos will notify NOPSEMA and provide updated details as soon as practicable and prior to the change occurring.

Additional information regarding Santos' operations can be obtained from the Santos website at: www.santos.com

1.7 Environmental management framework

OPGGS(E)R 2023 Requirements
Regulation 21(4)
The environment plan must: a) describe the requirements, including legislative requirements, that apply to the activity and are relevant to the environmental management of the activity; and b) demonstrate how those requirements will be met.
Regulation 24
The environment plan must contain the following: a) a statement of the titleholder's corporate environmental policy; b) a report on all consultations under section 25 of any relevant person by the titleholder, that contains: (i) a summary of each response made by a relevant person; and (ii) an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates; and (iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person; c) details of all reportable incidents in relation to the proposed activity.

The activity will be conducted in accordance with the Environment Health and Safety Policy (Appendix A) and Santos Management System (Section 8.1). In addition, there are a number of Commonwealth and Western Australian Acts/Regulations and international agreements and conventions relevant to the activity, as described in Appendix B.

Sections 6, 7 and 8 reflect the Environment Health and Safety Policy, detailing and evaluating impacts and risks from planned and unplanned events and providing control measures with set performance outcomes, standards and measurement criteria to ensure environmental performance is achieved.

1.8 Legislative Framework

OPGGS(E)R) Requirements
Regulation 21. Environmental assessment
Description of the activity 21(4) The environment plan must: a) describe the requirements, including legislative requirements, that apply to the activity and are relevant to the environmental management of the activity; and b) demonstrate how those requirements will be met.

1.8.1 International legislation

Australia is signatory to numerous international conventions and agreements that obligate the Commonwealth government to prevent pollution and protect specified habitats, flora and fauna. Those that have been considered during development of this EP are detailed in Appendix B.

1.8.2 Commonwealth legislation

The *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act) is the principal legislation managing petroleum activities in Australian Commonwealth waters.

The OPGGS Act and supporting regulations address all licensing, health, safety, environmental and royalty issues for offshore petroleum and gas exploration and production operations in Commonwealth waters.

Specifically, the OPGGS(E)R prescribe the requirements for management of environmental impacts associated with petroleum activities and require proponents to submit an EP to the Regulatory Authority for approval prior to the commencement of activities. As part of these documents, the proponent is required to assess the risks associated with the activities and demonstrate that the proposed mitigation measures reduce these risks to ALARP and acceptable levels.

IMMR activities covered under this EP evaluates the infrastructure integrity and applies applicable measures, based on risk, to ensure well and subsea infrastructure may be maintained for future removal in accordance with Section 572(3) of the OPGGS Act.

1.8.3 State legislation

In the event of a WHP or DC supply pipeline loss of integrity or a vessel collision, there is the potential for the spill to impact on State waters and shorelines. Relevant State legislation is detailed in Appendix B.

2. Activity description

OPGGS(E)R 2023 Requirements
Section 21. Environmental assessment.
Description of the Activity: 21 (1) The environment plan must contain a comprehensive description of the Activity including the following: a) the location or locations of the Activity; b) general details of the construction and layout of any facility that is used in undertaking the activity; c) an outline of the operational details of the Activity (for example, seismic surveys, exploration drilling or production) and proposed timetables; and d) any additional information relevant to consideration of environmental impacts and risks of the Activity. Note: An environment plan will not be capable of being accepted by the Regulator if an Activity or part of the Activity, other than arrangements for environmental monitoring or for responding to an emergency, will be undertaken in any part of a declared World Heritage property – see Section 34.

In accordance with OPGGS(E)R 2023, this section provides a description of the Reindeer facilities, their location and the activities undertaken to support operations. It also provides a description of the CoP phase that will follow when production from the Reindeer field is no longer economically viable.

2.1 Location

The Reindeer gas field is located within permit area WA-41-L, ~80 km northwest of Dampier, in the Barrow Sub-basin on the North West Shelf, offshore of Western Australia, as presented in Figure 2-1 and Figure 2-2. The DC supply pipeline is located within pipeline licence WA-18-PL. The on title infrastructure is also shown in Figure 2-1 and the coordinates for all infrastructure within the WA-41-L permit area and pipeline licence WA-18-PL are provided in Table 2-1.

The Reindeer infrastructure associated with the activities defined in this EP is detailed within Section 2.4.

Table 2-1: Surface Locations for Infrastructure on WA-41-PL and WA-18-PL

Infrastructure Name	Coordinates (Datum/Projection: GDA 94 Zone 50)		Production Permit or Licence	PSZ	Water depth (m) LAT	Status as at January 2024
	Latitude (South)	Longitude (East)		Y/N		
Reindeer WHP	-20.0240938	116.3097222	WA-41-PL	Y	61.3	Unmanned WHP
Reindeer-1	-20.0137562	116.3096904	WA-41-PL	N	30	Temporarily Abandoned, casing stump in place above mud-line
Reindeer-2	-20.02413624	116.3097439	WA-41-PL	N	46.7	Active well
Reindeer-3	-20.02413642	116.3097206	WA-41-PL	N	61.3	Active well
Reindeer-4	-20.02413624	116.3097439	WA-41-PL	N	61.3	Plugged and abandoned
Reindeer-4 ST1 (sidetrack well)	-20.0241366	116.3096972	WA-41-PL	N	46.7	Active well
Gnu-1	-20.02327516	116.3040154	WA-41-PL	N/A	33.7	Plugged and abandoned. Wellhead removed
Caribou-1 RE	-20.04260237	116.3038947	WA-41-PL	N/A	35.4	Plugged and abandoned. Wellhead removed
Caribou-1	-20.04260237	116.3038947	WA-41-PL	N/A	35.4	Plugged and abandoned. Wellhead removed
Pluto pipeline crossing	-20.21694444	116.322222	WA-18-PL	N	50.5	In operation – Not a Santos Asset

Infrastructure Name	Coordinates (Datum/Projection: GDA 94 Zone 50)		Production Permit or Licence	PSZ	Water depth (m) LAT	Status as at January 2024
	Latitude (South)	Longitude (East)		Y/N		
DC supply pipeline WHP to /Commonwealth boundary interception	Start:−0.02408333 End:−0.41094444	Start: 116.30972222 End: 116.335833	WA-18-PL	N	38.0	In operation

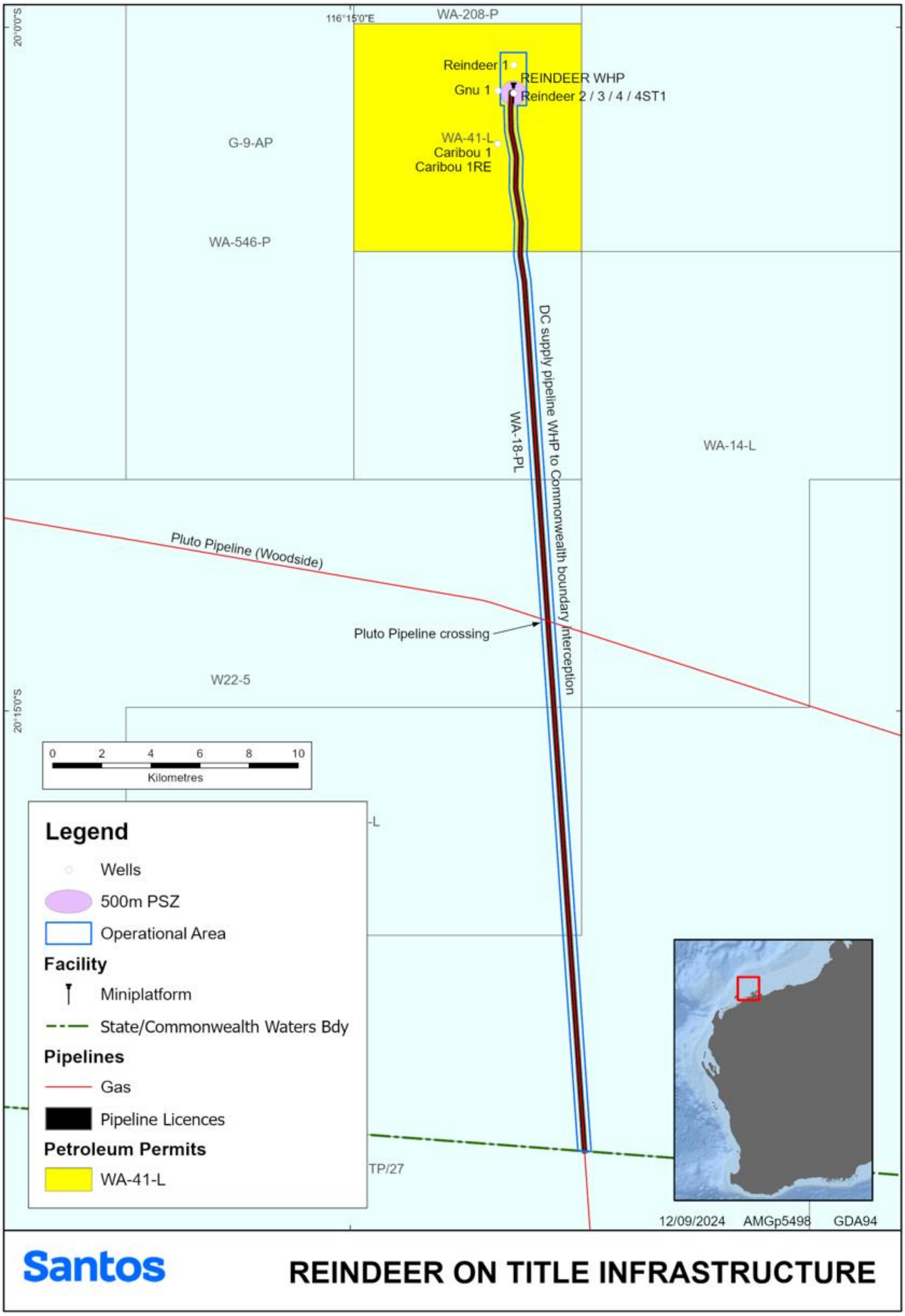

Figure 2-1: Reindeer on title infrastructure operational area

2.2 Operational area

The operational area is defined as the area shown in Figure 2-1 and Figure 2-2 comprising:

- A 250 m buffer either side of the Commonwealth waters section of the DC supply pipeline (from the WHP to the State waters limit)
- A 2 km × 1 km buffer around the WHP and Reindeer-1 well.

The operational area includes a charted 500 m petroleum safety zone around the WHP. A cautionary area designated by the Australian Maritime Safety Authority (AMSA) with a radius of 2.5 nautical miles (nm) is charted around the WHP.

The extent of the operational area has been defined based on the physical footprint of the activities detailed in this EP associated with the operation of the Reindeer facilities.

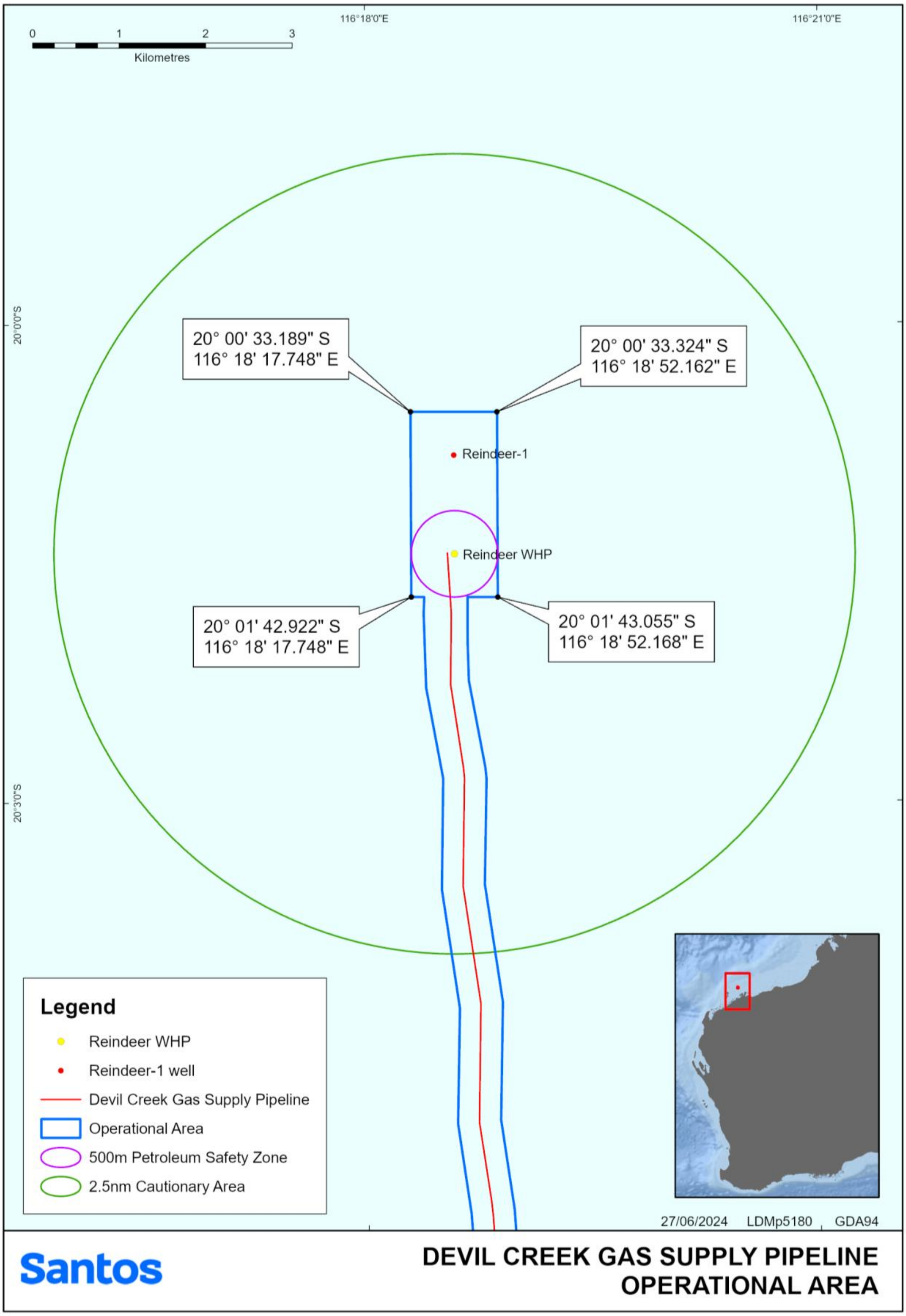

Figure 2-2: Location of operational area around Reindeer WHP and Reindeer-1

2.3 Activity duration and timing

The Reindeer facilities operate 24 hours a day, every day of the year and all activities could occur at any time of year, (day or night). The Reindeer facility is expected to go into the CoP phase in late 2024 or early 2025.

During the operation and CoP phase IMMR campaigns may be undertaken which include activities such as, surface inspections, subsea inspections and well intervention activities. Individual general IMMR campaigns are expected to take around 14 days.

CoP (preservation) activities are described in Section 2.10. Campaigns associated with CoP activities are expected to take around 30 days. Timing and duration of these activities is subject to change due to project schedule requirements, vessel availability, unforeseen circumstances and weather. This EP has risk assessed proposed activities throughout the year (all seasons) to provide operational flexibility.

2.4 Vessel operations

Vessel use is needed to support all offshore activities. Visits to the WHP utilising a support vessel for activities such as the replenishment of chemicals, diesel fuel for WHP power generation, and potable water will be undertaken routinely. The support vessel will also be used to backload any equipment, waste and materials that require offloading.

Dedicated equipment-specific vessels that may be used include diving support vessel, Remotely Operated Vehicle (ROV) support vessel, or a support vessel equipped with remotely -operated towed vehicle (ROTV), Autonomous Underwater Vehicle (AUV) or Sidescan Sonar (SSS) equipment. Unmanned vessels may also be used for IMMR. Maintenance, CoP or well intervention activities may typically require 1–2 vessels within the operational area.

Vessel-to-vessel refuelling is not normally required for routine activities associated with the Reindeer facilities, as these activities usually have a limited duration and scope. Similarly, vessel to vessel equipment transfers are rarely required. However, depending on the nature and scale of a non-routine activity, a material or fuel transfer may be needed in rare instances. Therefore, the impacts and risks associated with these activities are included in this EP.

Vessels may use dynamic position (DP) to hold position but there are circumstances where anchoring could be required. Therefore, the impact and risks associated with anchoring, including appropriate management controls, are included in this EP.

Support vessels are usually locally based (e.g. Port of Dampier). However, there may be instances where non-local vessels are considered due to availability or task specification requirements. Therefore, the impact and risks associated with sourcing non-local vessels, including appropriate management controls, are included in this EP.

2.5 WHP visits

The WHP is a normally unmanned facility. As such, inspections and maintenance activities are conducted on a scheduled and as-needed basis. Inspections and maintenance of the WHP and DC supply pipeline are managed using a Computerised Maintenance Management System (CMMS).

Site safety and general maintenance inspections of the WHP are conducted routinely. These routine inspections are undertaken to maintain the integrity of structures and production systems. Visits to the WHP are generally conducted via helicopter, using the helideck, but may also be conducted via vessels. Replenishment of chemicals, diesel fuel and potable water will be performed during visits conducted using an offshore support vessel.

2.6 Overview of the facilities

The Reindeer facilities comprise:

- An unmanned, minimum-facilities wellhead platform (Reindeer WHP) with three conventional production wells remotely controlled from the onshore DCGP. The substructure is a four-legged jacket with one skirt pile per leg and four levels topsides with an integrated helideck located on the upper deck
- An open ocean well (Reindeer-1), which is temporarily plugged and abandoned and not connected to the WHP
- A single 406 mm (16″) subsea and offshore gas pipeline (DC supply pipeline) linking the WHP to an onshore gas treatment plant (the DCGP).

A 500 m-radius petroleum safety zone surrounds the WHP. A cautionary area designated by the AMSA with a radius of 2.5 nautical miles (nm) is charted around the WHP. The Reindeer facilities are all marked on nautical charts.

2.6.1 Wellhead platform topsides infrastructure

The topsides module has four levels, specifically (highest to lowest):

- Upper deck, including the helideck
- Mezzanine deck
- Main deck
- Cellar deck.

The WHP general arrangement is shown in Figure 2-3.

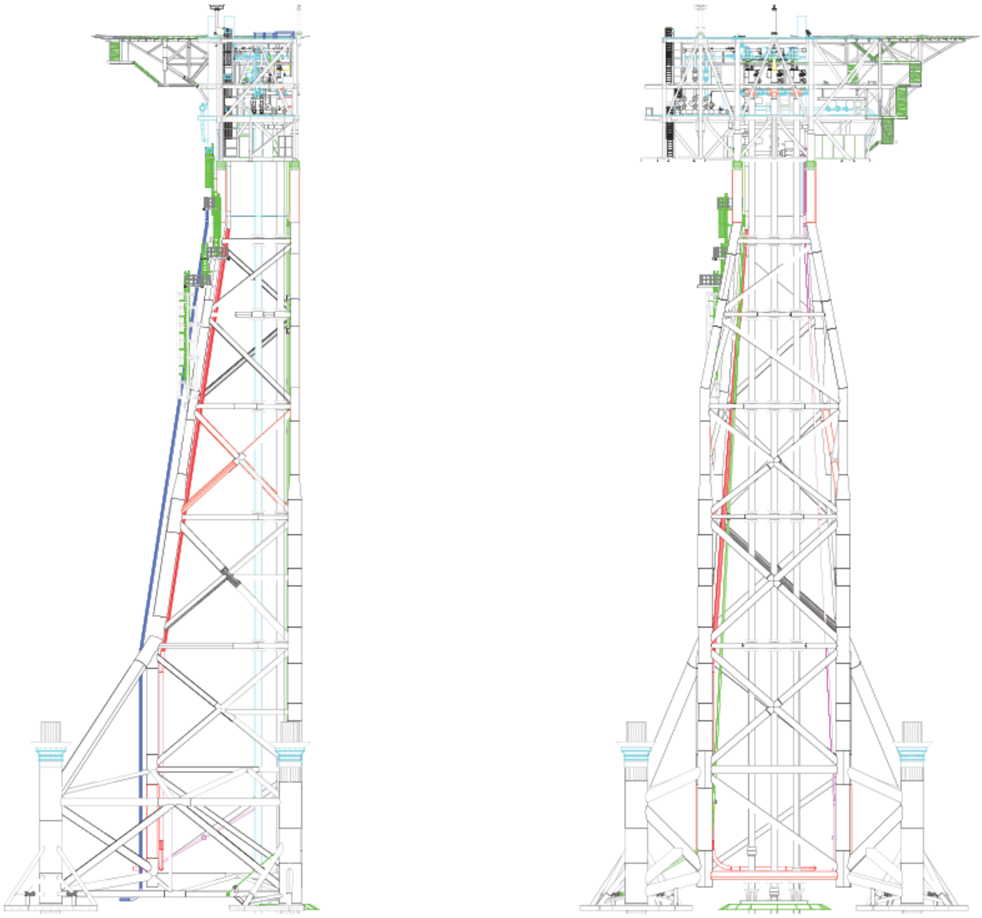

Figure 2-3: Reindeer WHP general arrangement

2.6.1.1 Upper deck

This is the top level of the topsides and contains a crane, a laydown area, and hatches to access the six well slots (three currently operational). The upper deck is completely bunded and is level with the helideck.

Three Christmas trees on the operational wells are located between the main deck and upper deck and hence straddle the central section of the mezzanine deck.

A crane is available to transfer supplies from support vessels onto the WHP laydown area and facilitate well intervention operations. Supplies consist of bulky chemical containers, diesel containers, potable water, replacement parts and other materials. Chemicals (Section 2.7.5) and diesel (Section 2.7.4) are not bunkered onto the platform but are moved across in bulk containers and transferred from these containers into the designated storage containers using hoses. The chemical storage tanks and water tank are located on the underside of the upper deck. The diesel tank is located in the crane pedestal.

Solar panels may also be installed and replaced as necessary on the platform. The deck is steel plated and fitted with piping to the open drainage system (Section 2.7.3).

2.6.1.2 Helideck

The helideck is located on the eastern end of the upper deck and is used to access the WHP for routine maintenance and inspection. It is suitable for helicopters up to and including D values of 16 m and T values of

5.3 tonnes, as well as AW139 helicopters. The design incorporates an atmospheric drainage system to collect rainwater runoff, which is piped overboard (Section 2.7.3). The helideck is not bunded.

2.6.1.3 Mezzanine deck

The mezzanine deck is located below the upper deck and contains the equipment room, wellhead control panel, hydraulic power unit and crane power pack. There is also a laydown area for materials handling. A pig launcher is also located on the mezzanine deck for inline inspections of the DC supply pipeline. The deck is mostly covered with steel grating and is not bunded; however, there is localised bunding around the hydraulic power unit pump, the equipment room and the wellhead control panel, which drains to the atmospheric drainage system (Section 2.7.3).

2.6.1.3.1 Equipment room

The equipment room accommodates the electrical and control equipment for the platform, including the local controls such as the emergency shutdown (ESD) system, as well as all other electrical equipment and communications.

2.6.1.3.2 Pig launcher/receiver

The pig launcher/receiver, capable of launching a standard complement of foam, brush, scraper or intelligent pigs, is located above the export pipeline riser to afford crane access. Liquids from the pig launcher/receiver are directed into the closed drainage system (Section 2.7.3).

2.6.1.4 Main deck

The main deck, located below the mezzanine deck, contains the production manifold and manual isolation valve for the wellheads.

The main deck also contains the fuel gas equipment and back-up diesel generator. There is a laydown area for materials handling. The main deck is completely bunded, and the bunding feeds into the atmospheric drainage system (Section 2.7.3).

2.6.1.5 Cellar deck

The cellar deck contains the closed drainage system sump, atmospheric drainage system (Section 2.7.3), riser ESD valve and fuel gas microturbines. There is a laydown area provided for materials handling. The cellar deck is mostly covered with steel grating, except under the two microturbine generators, which are bunded. Bunding is also located around the atmospheric drainage system.

2.6.1.6 Production manifold and online telemetry systems

The production manifold consists of flow meters for monitoring gas production, electrically actuated choke valves for controlling the quantity of gas being produced, and online corrosion detection probes.

All production data is continuously monitored via telemetry by the DCGP or Perth Operations control room, where adjustments are made to the operation of the WHP to meet optimal performance. The telemetry system also allows some testing and checks to be made remotely. The production system and testing can also be controlled by personnel on the WHP, accessed using the wellhead control panel located on the mezzanine deck.

2.6.1.7 Shutdown valves

Shutdown valves are located at various points along the gas supply system to allow the separation and isolation of the gas process systems from other parts of the system. The Christmas trees also have master and wing valves that provide isolation if required.

The shutdown valves include an ESD valve located on the export riser, and all wells also incorporate a surface-controlled subsurface safety valve in the subsea production tubing as an additional barrier to isolate the platform from the reservoir. There is also a subsea isolation valve on the DC supply pipeline.

2.6.2 Description of safeguards and emergency shutdown and emergency blowdown systems

Safeguarding systems are in place to automatically detect any abnormal process or upset condition, to alert the operator or control interface, and to execute actions (such as process inventories or initiation of blowdown and shutdown of equipment as outlined in this section).

2.6.2.1 Safeguards overview

Safeguarding systems form part of the overall emergency support system installed on a facility. The safeguarding systems are required in an emergency to:

- Provide protection for personnel
- Minimise the release of hydrocarbons
- Prevent damage to equipment, plant and structure
- Remove or isolate hydrocarbon inventory
- Prevent escalation of a single incident to other areas.

The safeguard measures fall into the following general categories:

- Control systems: to maintain operating parameters within prescribed limits
- Process alarms (including gas detectors on the WHP): to alert operators if operating parameters move outside prescribed limits
- Depressurisation and automated ESD: to isolate and blowdown sections of the facility to bring it to a safe condition.

The emergency shutdown and emergency blowdown activities for the Reindeer facilities are outlined below.

2.6.2.2 Automated emergency shutdown

When the facilities shutdown is activated, the DC supply pipeline is also shut in. The wells are shut in along with the shutdown of the equipment on the platform. All safety systems on the WHP are designed as fail safes, with the wells and WHP isolated. Automatic shutdown is preceded by a pre-alarm relayed to the onshore control room. In addition, if an ESD at the onshore DCGP occurs, the WHP and associated wells will also automatically shut in. In addition, an automatic low-pressure alarm trip is on the production header and on each of the well flowlines. The low-pressure alarm is monitored at the DC control room, automated with the trigger set to 6000 kPa. Hydrocarbon gas-point detectors are provided for all areas where a potential major gas leakage and/ or gas accumulation could occur on the WHP. Confirmation of potential hydrocarbon gas in the equipment room results in a platform ESD which de-energises all electrical systems accordingly.

2.6.2.3 Emergency blowdown activities

There is no automatic depressurisation for the WHP. The production system remains pressurised after shutdown. The overpressure protection system protects the DC supply pipeline from overpressure conditions. Pressure safety valves are provided on the WHP and relieve at a set pressure, as specified on the process and instrumentation diagrams and pressure safety valve datasheets.

2.7 Ancillary Systems

2.7.1 Power generation

Electrical power for WHP equipment and machinery is generated by two gas-fuelled microturbines (sourced from the WHP supply) that have their own protection and detection systems incorporated into the package. Entrained water in the fuel gas is removed through coalescers and collected in the closed drainage system (Section 2.7.3).

Hydraulic power required for the WHP equipment is provided by an electrically-driven hydraulic power unit (HPU), while hydraulic power for the crane is supplied by a separate diesel-driven power pack.

A diesel generator is also provided for black start. This starts automatically on loss of both gas-fuelled microturbines. The diesel generator can also be started remotely for routine maintenance or test runs and has a dedicated battery for starting.

Diesel is stored in a 3.1 m^3 diesel storage tank located in the crane pedestal and fed by an electrically driven diesel transfer pump into the diesel generator day tank (400 L capacity) and the HPU tank (900 L capacity).

Diesel is supplied to the WHP via bulk containers lifted onto the upper deck from offshore support vessels and decanted into the diesel storage tank in the crane pedestal via hose.

During preservation phase diesel will be transferred via bulk containers to the HPU tank via hose. A temporary bunded diesel storage tank with a capacity of up to 4 m^3 may be required on the upper deck to provide fuel capacity.

During the preservation phase a solar powered remote monitoring skid (RMS) may be required to provide monitoring and power to critical infrastructure on the WHP.

2.7.2 WHP lighting

The WHP is designed for unmanned operation; hence, only minimal permanent operational lighting is provided, consisting of safety and navigation lighting using flashing amber lights. Additional fluorescent lighting is available in the event of an emergency. In the event night-time activities are scheduled, any additional lighting required will be provided by portable lighting supplied by personnel visiting or working on the platform.

2.7.3 Drain systems

A closed drainage system (sump, process vent to atmosphere and electric pumps) is present on the WHP to capture liquids from the following sources:

- Liquid separated in the fuel gas system
- Drainage and depressurisation of topsides production piping prior to maintenance
- Drainage of the pig launcher
- Pressure relief valves.

The closed drainage system has a maximum storage capacity of 2,100 L, sized to contain the contents of a single flowline, the production manifold or the pig launcher. Liquids collected in the closed drainage system sump are returned intermittently to the production manifold by the sump pumps. During CoP phase the closed drain system will be isolated from discharges

An atmospheric drainage system (with atmospheric venting) is provided for the collection of rainwater, wash-down water and spillage from the bunded upper and main decks. The open drainage system sump (referred to as the atmospheric sump) is built into the cellar deck and has a capacity of 7,240 L. The atmospheric sump enables the separation of hydrocarbon liquids from water collected through the atmospheric drainage system and the reinsertion of the hydrocarbon liquids into the production line via the atmospheric sump pump. The atmospheric sumps are dosed with low concentrations of biocide to prevent bacterial contamination in the DC supply pipeline.

When the Reindeer facility is in the CoP phase, the atmospheric sumps can no longer be pumped out into the production line and therefore are manually pumped out to tanks for transport back to shore.

2.7.4 Hydrocarbon storage

Approximately 3.1 m^3 of diesel is stored on the WHP. A small amount (~200 L) of hydraulic fluid is required during operation of the wellhead control panel. A temporary bunded diesel storage tank with a capacity of up to 4 m^3 may be required on the upper deck to provide fuel capacity following CoP.

High-pressure process hydrocarbons contained within the process systems on the platform can be released (cold vented) during maintenance activities or in the event of an incident. The well stream hydrocarbons are mainly methane. Cold venting of a process area is done through the closed drainage system (Section 2.7.3).

There are also hydrocarbon inventories within the subsurface reservoir (isolated from the platform via the Christmas tree master and wing valves, surface-controlled subsurface safety valve and within the DC supply pipeline, downstream of the subsea isolation valve).

2.7.5 Chemical storage

The main chemical used on the WHP is corrosion inhibitor, which is injected into the well stream. This is used to prevent internal corrosion of the DC supply pipeline. The chemical injection system includes three chemical injection tanks (one × 3,800 L, two × 1,600 L), which are filled from bulk containers lifted onto the WHP via the crane as required. A chemical injection point has also been provided in the same location for injection of methanol or monoethylene glycol, which is used as a hydrate inhibitor or scale inhibitor, if required.

2.7.5.1 Corrosion prevention

The WHP and its substructure are painted as part of corrosion management. The submerged zone is painted and also protected by sacrificial anodes with a design life of 20 years.

2.7.5.2 Miscellaneous

The following general items are provided on the WHP:

- Bird deterrent device (Section 2.9.13) to stop bird infestation and nesting and associated guano hazards

- Flushing toilet;
- 2,500 L potable water tank with two stainless-steel hand wash basins; and
- Water from the flushing toilet and hand wash basins are directed directly overboard.

2.8 Subsea infrastructure

As at December 2023, there are three production wells tied back to a six-slot unmanned WHP with four legs concreted into the seabed. There are Christmas tree master and wing valves provided for isolation. All wells also incorporate a downhole surface-controlled subsurface safety valve in the production tubing as an additional barrier.

The Reindeer-1 well is located ~1.3 km north of the WHP. It is an open ocean well, with a cap installed (~3 m high), and not connected to the WHP. This subsea well is temporarily abandoned.

2.8.1 DC supply pipeline

The DC supply pipeline extends ~103 km from the WHP to the DCGP. It runs in a southerly direction from the WHP to the mainland, crossing over the Pluto pipeline ~21 km south of the WHP, and passing from the Commonwealth waters boundary into State waters ~48.3 km seaward from the mean low water mark, reaching the shoreline at Gnoorea Point. A subsea isolation valve is located ~60 m west of the platform on the DC supply pipeline, and an ESD valve is located at the DCGP.

Concrete coating has been applied to the DC supply pipeline for primary stabilisation. Secondary stabilisation (gravity anchors) has been installed at the Pluto pipeline crossing and at the riser tie-in spool. An external anti-corrosion coating has been applied, and sacrificial anodes are used to protect against external corrosion. The gas export riser connecting the DC supply pipeline to the WHP is located within the WHP substructure bracing to provide protection against vessel impact.

The DC supply pipeline transports Reindeer condensate from the WHP to the DCGP. Reindeer condensate is described in Section 7.5.4.

2.9 Inspection Maintenance Monitoring and Repair activities

Inspection, monitoring, maintenance, and repair (IMMR) of all infrastructure will be performed in accordance with the CMMS for Reindeer.

Maintenance activities may include corrective (e.g. repair and replacement of equipment) and non-routine maintenance, undertaken in accordance with routine or corrective work orders. Generally, these activities may involve additional personnel and the use of ROVs, divers and work vessels, which may require anchoring at or near the work location.

IMMR activities may be undertaken during the operations and CoP phases.

IMMR activities that may be undertaken are:

- Subsea and pipeline integrity and corrosion management
- Subsea pipeline and seafloor imaging surveys
- ROV surveys
- Diver surveys
- Cathodic protection surveys
- Plant inspection and maintenance
- Plant modifications
- Marine growth removal
- Flushing and cleaning
- Corrosion control
- DC supply pipeline route maintenance
- Inline inspections of the DC supply pipeline (pigging)
- Well intervention

- Well suspension.

It is through the implementation of this maintenance regime and preservation activities (Section 2.10) that Santos will meet its obligations under the OPGGS Act (s.572(2)) to 'maintain in good condition and repair all structures that are, and all equipment and other property that is, in the title area and used in connection with the operations'.

2.9.1 Subsea and pipeline integrity and corrosion management

Inspections of the subsea infrastructure (including Reindeer-1) and DC supply pipeline are scheduled through the CMMS and performed in accordance with routine work orders. Maintenance activities can also be conducted on an as-needed basis, depending on the results of the inspections, through corrective work orders.

Offshore external inspection of all Santos subsea assets, including the Reindeer facilities, is based on asset class, as outlined in the Subsea Inspection Procedure (SO-35-IS-00001). This procedure covers inspection of all subsea infrastructure, including structural, riser, pipeline, conductor and subsea system assets. The offshore inspection requirements of the WHP risers and pipelines are described in the Reindeer Offshore Facilities Reindeer WHP Performance Standard Assurance Plan: PS-03 Hydrocarbon Containment: Risers and Pipelines (RE-00-RG-00044) and require AUV and cathodic protection and general visual inspection surveys.

Additional inspections may be performed following physical events (e.g. extreme weather, sea conditions, third-party interactions), integrity assessments or other triggers that indicate further inspection is required. Post-cyclone inspection may include GV inspection, pipeline, spools and wellhead observation by ROV may be able to provide additional surveillance of anomalies or areas of interest flagged by inspections or analysis.

Inspections require a dedicated equipment-specific vessel, such as a diving support vessel or ROV support vessel, or a support vessel equipped with a ROTV, AUV or SSS equipment.

2.9.2 Subsea, pipeline and seafloor imaging surveys

Subsea, pipeline and seafloor imaging surveys may be undertaken around the production wells and DC supply pipeline using methods and technologies such as single-beam echo sounders, multibeam echo sounders, side-scan sonars and AUVs to identify:

- Freespans
- Lateral and upheaval buckling
- Severe scour or other seabed disturbance
- Gross variation from as-laid positions
- Debris.

These surveys will provide input to integrity assessments and will assist in planning future inspection campaigns, if required.

2.9.2.1 Single-beam echo sounders and multi-beam echo sounders

Single-beam echo sounders (SBESs) use a hydrographic technique that provides the water depths and an image of the seabed and DC supply pipeline by measuring the two-way travel time of a high-frequency sound pulse emitted by a transducer. The transducer, generally mounted on a vessel or to an AUV, also tracks the motion of the unit it is mounted on in order to allow for correction of the motion. Multi-beam echo sounders (MBESs) work in the same way but produce a swath or acoustic fan-shaped pulses of sound made up of many single beams.

2.9.2.2 Side scan sonar surveys

Side scan sonar (SSS) is a marine geophysical technique that is used to produce an image of the seafloor and identify obstructions or features. This type of survey is a hydro-acoustic technique, comprising a set of transducers mounted on either side of a towed vehicle, towed ~10–20 m above the seabed. SSS transducers may be mounted on AUV systems, vessel hulls or, more commonly, using an ROV.

2.9.2.3 Sub-bottom profilers

Sub Bottom Profilers (SBP) utilise an acoustic source typically towed just behind the vessel, with a hydrophone towed ~25 m behind the vessel to record the reflected sound waves. SBPs are typically used to understand physical characteristics of the sea floor (e.g. layering and thickness). Specifically, in relation to the implementation of this EP, sub-bottom profilers may be used to understand the depth of buried pipelines. In these instances, the sub-bottom profilers will report the depth of burial at a transect point along the section of burial and the profile of pipeline burial. The length of each sub-bottom profile inspection is dependent on the length of buried sections of the pipeline and may vary depending on the exact survey or inspection objectives.

2.9.2.4 Autonomous underwater vehicles

AUVs may be used to conduct a number of geophysical and inspection activities, including sub-bottom profilers, MBESs, SBESs, SSS, cameras, and conductivity, temperature and depth (CTD) profilers.

AUVs travel underwater on a predefined ‘flight path’ without requiring navigation from an operator and are fitted with various payloads for data acquisition. The size of the vessel required to deploy an AUV depends on the size of the AUV and the launch and recovery system. The AUV is typically deployed from a vessel using a crane or an A-frame and is recovered using a winch or net.

2.9.3 Subsea, pipeline and seafloor visual and sampling surveys

General visual inspection (GVI) surveys are used to identify the following:

- Integrity of the DC supply pipeline system, including all subcomponents
- Location of all features detailed on alignment sheets or as-built records
- Pipeline crossings for pipeline separation and integrity of any support structures and/or stabilisation
- Seabed topography, scour, pipeline settlement and extent of burial
- Freespan lengths, locations, heights and shoulder conditions (shoulders buried, partially buried, resting on seabed)
- Concrete weightcoat condition
- Coating condition, where visible, and indications of corrosion
- Pipeline protection, stabilisation, scour remediation and span rectification for condition and effectiveness
- Marine growth type and extent
- Debris in contact with or adjacent to the DC supply pipeline
- Excessive pipe movements, including expansion effects and lateral and upheaval buckling
- Other items or anomalies identified following previous inspections.

GVI surveys are generally conducted by ROV. In some circumstances, divers will be used to conduct general visual inspections and other inspections or works.

2.9.3.1 Environmental monitoring activities

Water and sediment sampling as part of environmental monitoring, may also be undertaken to understand baseline levels.. Environmental monitoring activities such as sampling of water, or seabed material (i.e. sediment) or investigation/sampling of biotic material (i.e. marine growth) for environmental studies may be undertaken.

2.9.3.2 Remotely operated vehicle surveys

An ROV is typically used to conduct subsea visual inspections and environmental surveys. The ROV is tethered to a vessel via an umbilical cable that provides power and control to an operator on the vessel. Thrusters are used to provide propulsion. The ROV is also fitted with a real-time feedback visual monitoring system and lights that provide video relay to the operator on the vessel, to allow the operator to subsequently manoeuvre the ROV into position to inspect the DC supply pipeline or wells. ROVs can be fitted with a mechanical arm that can also be controlled from the surface to undertake some maintenance activities.

ROVs are usually deployed using an A-frame or winch from a dedicated vessel. ROVs are linked to the vessel by a neutrally buoyant tether; or, often when working in rough conditions or in deeper water, a load-carrying umbilical cable is used along with a tether management system.

2.9.3.3 Diver surveys

Visual inspection or environmental sampling by divers is undertaken from a dedicated diving support vessel. Divers are tethered to a vessel via an umbilical, which provides communication, air and a video relay from a camera and lights on the diver’s helmet. Divers may also be used for maintenance activities. A Diving Project Plan is developed for each program, and all diving operations are performed in accordance with the Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009.

2.9.3.4 Cathodic protection surveys

Cathodic protection surveys are typically performed concurrently with general visual inspections. Cathodic protection, such as galvanic anodes and coatings, are applied to the DC supply pipeline and subsea infrastructure for corrosion control. The cathodic protection survey forms part of the general visual inspection, which generally covers the following:

- Galvanic anodes are inspected for depletion and security
- Direct-contact cathodic protection potentials of the anodes are taken using a cathodic protection probe
- Continuity strap integrity and effectiveness is tested by measuring potentials at each end
- Welds are inspected
- Ultrasonic wall thickness is tested
- Coating is removed for inspection access.

Cathodic protection is measured using an underwater cathodic protection probe and/or contactless cathodic protection survey method (field gradient method). Ultrasonic wall thickness testing is undertaken using an underwater ultrasonic wall thickness tester. Both are non-destructive test instruments.

2.9.4 Plant inspection and maintenance

The exterior of the WHP may be inspected using unmanned aerial vehicles. Unmanned aerial vehicles may also be used to conduct aerial surveys in the operational area. Unmanned aerial vehicles are autonomous aircraft that will use the WHP or a vessel as a launch platform to execute surveys and inspections of the structure to inform the planned maintenance system.

Routine maintenance activities, such as valve change-out, pump servicing, electrical hazardous area maintenance, cleaning, corrosion control (blasting/painting), visual and non-destructive testing inspections, and pipe spool replacement, are performed as required.

2.9.5 Plant modifications

Demolition and installation of new equipment on the WHP is occasionally required, due to changes in recovery rates or other operational modifications and upgrades. Any modifications to plant are covered under the Engineering Management of Change Procedure (SMS-OES-OS02-PD04) that ensures any environment impact is also considered and addressed prior to modifications occurring. Such alterations can include:

- Removing or replacing pipework and process units
- Equipment rationalisation
- Modifications to the WHP
- Upgrading the various components and equipment on the WHP
- Flushing, draining and recovering residual liquids from pipes
- Making piping, process and electrical alterations to accommodate operational changes to the field, such as new wells.

2.9.6 Marine growth removal

Marine growth on the substructures of offshore platforms and on subsea pipelines must be maintained at levels that do not compromise the structural integrity of the platform or DC supply pipeline. The WHP substructure provides attachment points for a variety of marine organisms that, over time, add significantly to the drag and weight on the substructure. As part of the maintenance of the facility, marine growth on the substructure is inspected in accordance with the Subsea Inspection Procedure (SO-35-IS-00001) using ROV and/or divers; if determined to be beyond the allocated depth, marine growth is periodically removed. This is performed on an as-required basis.

As part of ongoing maintenance and to facilitate inspections, the removal of marine growth from subsea infrastructure may be required. Marine growth is regularly monitored against design limits. Removal of marine growth is typically only required for inspection purposes and is conducted on localised areas using high-pressure water cleaning or brushing or a combination of these:

- Water-jetting: conducted by ROV or divers, water is pressurised to above hydrostatic pressure. Generally, water-jetting activities are through small-diameter water jets that act locally on the pipe or structure. Wash-out or induced currents are typically not experienced during this activity due to the nature of the operation.

- Brushing: typically, a coarse brush would be applied to the pipeline or structure on a localised area only. This is a less common technique.

2.9.7 Corrosion control

A program of ongoing fabric maintenance of the offshore platform is undertaken as part of the corrosion control program. Prior to painting, offshore structures are cleaned with mechanical cleaning, ultra-high-pressure water or grit blasted (a naturally occurring product).

Other corrosion control and monitoring activities may involve anode replacements on the Reindeer facilities, cathodic protection monitoring, weld inspections, ultrasonic wall thickness testing, free span inspection of the DC supply pipeline, coating removal for inspection access, pipeline repair clamp installation, leg wrap maintenance and installation, non-destructive testing, and general inspections and maintenance of subsea valves and other subsea equipment. This work is usually undertaken by ROV, AUV or divers operating on a diving support vessel, which may also involve the use of additional support vessels such as an anchor-handling vessel.

Periodic sampling of the pipeline contents also occurs across the life of the activity through operations and CoP. This can occur at the DCGP or WHP end of the pipeline, sampling may include testing for bacteria presence for example, to ensure effectiveness of preservation fluids.

2.9.8 DC supply pipeline route maintenance

Maintenance activities may require alteration of the seabed in the immediate vicinity of subsea infrastructure, such as movement of sediment from around the area to be worked on.

Where span rectification is required, various methods may be considered. The most common is grout bag installation. An empty grout bag is positioned under the DC supply pipeline by ROV or divers and pumped full of a measured volume of grout from the support vessel. Depending on the span height, several bags may be used at a single location to support the DC supply pipeline. A field support vessel or diving support vessel is used to support this activity. Where burial is observed, sediments will be jetted or airlifted to displace them from the top of the DC supply pipeline.

2.9.9 In-line inspection activities

In-line inspection of the DC supply pipeline, referred to as pigging, is a routine practice that is undertaken, as required, as part of ongoing pipeline integrity management. This practice may involve both the use of intelligent pigs, used for evaluating pipeline integrity and wall thickness, and standard brush and foam pigs, used for operational or corrosion control purposes. Pig launchers and receivers are permanently installed on the DC supply pipeline (at the WHP and DCGP respectively). Pigs are launched on the WHP and received at the DCGP. The disposal of pigging waste is outside of the scope of this EP and is managed in accordance with the DCGP Operations EP (DC-40-RI-00021).

2.9.10 Well intervention

Well intervention is a collective term for deployment of tools, fluids and equipment in pressurised or dead completed wells. A range of activities undertaken through well intervention are completed from the Reindeer WHP. These may include but are not limited to:

- Temporary abandonment and suspension of old wells in preparation for a drill rig to re-enter a well (mobile offshore drilling unit activities are not covered by this EP)
- Isolate subsea valves to the WHP or DC supply pipeline prior to the commencement of drilling or other topsides activities
- Remove plugs and perforate wells, whether new wells or new intervals of old wells
- Use bottom hole pressure surveys (for reservoir modelling and management), production logging tools to determine gas and water contact, installing bridge plugs to isolate water zones and perforating new zones in the well
- Trouble-shoot wells in terms of down-hole subsea safety valves
- Pump: bullhead well kill, lubricate bleed, annulus top ups, corrosion treatment, scale treatment, spotting cement at reservoir
- Perform well servicing including Christmas tree maintenance and removal (from the WHP only) and wireline logging in the well bores.

During well intervention work, a dedicated crew undertakes the required intervention work, either from the platform (day shift) or from a vessel (day and night shift) as required.

The only intervention that is proposed under this EP is for production wells from the WHP or a vessel (i.e. rigless intervention), no intervention activities are planned on the Reindeer-1 subsea well as it is plugged and abandoned.

2.9.11 Abandonment or suspension

During the field life, wells may be temporarily suspended or plugged and abandoned in accordance with the requirements of the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGS Act). This process usually involves placing cement plugs within the casing of the well at various intervals, then flooding the casing with fluids containing corrosion inhibitor and/or biocide. Well intervention equipment used for these activities will either be lifted aboard and operated on the WHP or operated from a support vessel. Any activities involving the use of a mobile offshore drilling unit (MODU), such as the drilling of new wells or permanent abandonment of wells, are not covered in this EP.

Depending upon the specific well activity requirements at the time, purging the DC supply pipeline and process equipment of any residual hydrocarbons may be required, including leaving the DC supply pipeline in situ until a final decommissioning program has been developed.

2.9.12 Cold venting

There is no flare on the WHP; therefore, any gas emissions are cold-vented. Fugitive emissions can also occur during cold venting.

Cold venting will typically occur under the following circumstances:

- Manual depressurisation of the production system for maintenance
- Depressurisation and draining of the pig launcher after each use.

Cold venting typically occurs during the operational phase however cold venting of wells may still be required after CoP during the preservation phase.

2.9.13 Bird deterrent activities

Safety of aircraft and passengers visiting the WHP is paramount. Management of birds for the safe landing and take-off of helicopters is critical. In addition, the platform needs to be clear of guano on both the top deck and helideck surfaces to avoid the potential for slips, trips and falls.

Due to potential bird strikes on helicopters when approaching the platform to land, various bird deterrent systems are used. They include passive management measures (such as bird spikes and netting) as well as intermittent loud noise, vibration and light.

Note that previous experience has shown that birds may become desensitised to specific bird deterrents over time. Therefore, during the life of this EP, there may be a requirement to investigate further deterrent options, which may use noise, vibration or light emissions.

Santos have an approved permit to install and operate bird deterrence equipment on Reindeer WHP (Permit E2020-0173), which expires on 26 February 2025..Santos intends to renew this permit. The permit authorises Santos to install and operate passive deterrent equipment, an acoustic hailing system with a maximum volume output of 110 dB at 10 m (horizontal distance) and a laser system of maximum class 2M at the Reindeer Platform.

2.10 Preservation activities

Once the Reindeer facilities reach the end of field life they will need to be flushed of hydrocarbon and preserved for future decommissioning or re-purposing. Once flushing commences with the intent to decommission or repurpose this is the CoP phase of the activity. Further detail on planning for repurposing and decommissioning is provided in Sections 2.12 and 2.13.

The Reindeer facilities are expected to be in preservation phase for a minimum of 36 months while decisions are made on whether the facilities will be decommissioned or repurposed. A decision on future repurposing of the Reindeer facilities is expected to be made in the near future.

2.10.1 Preservation of DC supply pipeline

2.10.1.1 Flushing to clean and initial preservation

Prior to the preservation, the DC supply pipeline will be flushed to clean the pipeline and reduce the residual hydrocarbon concentration. The residual hydrocarbon target is 30 ppm or lower. The flushing spread will be from a vessel adjacent to the WHP or from the WHP, this depends on the size of the equipment spread and the available deck space on the platform. The flushing fluids will comprise seawater treated with a combined oxygen scavenger and biocide chemical treatment package. Section 2.11 describes the chemical selection assessment process that will be used for the preservation chemicals.. Hydrosure and biocide will be used as preservation fluids.The flushing fluids will be pigged back to discharge at the DCGP, and no discharge to sea will occur. Once flushing for cleaning has been complete the DC supply pipeline will be filled with treated seawater (13,000 m^3) and positively isolated from the flowlines on the WHP and the inlet at DCGP.

Once the pipeline has been filled with treated seawater it will remain in this preservation status until one of the options is selected as outlined in Section 2.12. This decision is dependent on whether the pipeline will be decommissioned or re-used.

2.10.2 Additional Preservation

The DC supply pipeline may require additional preservation in the future, to maintain pipeline integrity for repurposing, or, to maintain integrity for decommissioning. Future preservation may be undertaken using chemically treated seawater or an inert gas such as nitrogen.

2.10.2.1 Nitrogen preservation

If an inert gas such as nitrogen is used, this will be pushed through from the DCGP end of the pipeline. During preservation using nitrogen, the treated seawater that is in the pipeline following flushing during CoP will need to be discharged from the WHP to the marine environment. The nitrogen spread may not fit on the WHP due to the limited deck space. A large DP vessel could be utilised adjacent to the WHP, but this is not currently considered as an option due to the size of the vessel required and the risks associated with a hose transfer between the vessel and WHP for nitrogen management. Therefore, the nitrogen flushing spread would be temporarily installed at the DCGP end and powered independently. The planned discharge to sea from the WHP would be the full contents of the pipeline: 13,000 m^3 of treated seawater.

2.10.2.2 Re-preservation with treated seawater

The pipeline may be required to remain in preservation phase for more than three years if there are delays to decommissioning or repurposing activities. If this occurs the treated seawater within the pipeline loses its effectiveness and there is the risk of bacterial growth which can effect the integrity of the pipeline. Therefore, the pipeline may be flushed and re-filled with treated seawater again. This can occur from the WHP (either on deck or from a vessel) or from DCGP end of the pipeline.

If it was to occur from the WHP, the treated seawater would be discharged to the DCGP evaporation ponds via the produced water system and spools. However, as the DCGP is nearing CoP and decommissioning phase, there is the possibility that the equipment required will no longer be available by the time re-preservation may be required as it has been removed or the power has been disconnected for example. Therefore, Santos has included the worst-case scenario of flushing the pipeline from the DCGP end to the WHP and discharging the pipeline contents to the marine environment (13,000 m^3 of treated seawater).

If this option is selected, a temporary flushing spread would be mobilised to the DCGP with an independently powered generator to tie into the pipeline and undertake the flushing and re-preservation of the pipeline.

If additional preservation is required this could take place from the WHP or from the DCGP. If preservation takes place from the WHP, the treated seawater will be discharged to the DCGP. If preservation takes place from the DCGP the treated seawater will be discharged from the WHP to the marine environment.

2.10.3 Preservation of WHP

SoOps and preservation of the WHP will be undertaken over several campaigns due to limitations on personnel on board (PoB) on WHP and comprise five key stages:

- Stage 1- the Reindeer WHP wells are shut in and positively isolated. The topsides were then depressurised, drained of liquid and purged of hydrocarbon gases. The liquids and gases are purges through the pipeline back to DCGP

- Stage 2- this involves ensuring the suspended topsides are free of hydrocarbons and hazardous chemicals (excluding diesel), this includes filter removal, purging, flushing, and cleaning with surfactants. Removal filters are disposed of onshore in accordance with legislative requirements, Flushing liquids would be transferred through the pipeline to DCGP or transferred to tanks and transported to shore for disposal via vessel.
- Stage 3- the topsides are preserved using nitrogen, nitrogen is added to the topsides via a nitrogen cylinder pack on the WHP
- Stage 4- The RMS including solar panels and instruments is installed on the WHP,
- Stage 5-involves the isolation of micro turbines, removal of redundant batteries and isolation of redundant instrumentation

2.11 Chemical Assessment

A risk-based approach to select chemical products ranked under the OCNS is applied for those chemicals used and discharged to the marine environment. This scheme lists and ranks all chemicals used in the exploration, exploitation, and associated offshore processing of petroleum on the UK Continental Shelf.

Chemicals are ranked according to their calculated hazard quotients by the Chemical Hazard Assessment and Risk Management (CHARM) mathematical model, which uses aquatic toxicity, biodegradation, and bioaccumulation data. The hazard quotient is converted to a colour banding with Gold and Silver colour bands representing the least environmentally hazardous chemicals. Chemicals not amenable to the CHARM model (i.e. inorganic substances, hydraulic fluids or chemicals used only in pipelines) are assigned an OCNS grouping based on the worst-case ecotoxicity data with Group E and D representing the least hazard potential.

The Santos Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) accepts CHARM ranked Gold/Silver, or non-CHARM ranked E/D chemicals for use and discharge without a detailed environmental risk assessment. The same applies to chemicals that are OSPAR Pose Little or No Risk to the Environment (PLONOR) List. The PLONOR Listed, agreed upon by the OSPAR Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic), contains a list of substances that will pose little or no risk to the environment in offshore waters. If chemicals are ranked lower than Gold, Silver, E or D (i.e. CHARM ranked purple, orange, blue or white, or non-CHARM A, B or C ranked chemicals) and no alternatives are available, a risk assessment is conducted providing technical justification for their use and showing their use and associated risk is acceptable and ALARP.

As described above, potential alternative chemicals are investigated when chemicals are ranked lower than CHARM Gold, Silver, E or D (i.e. CHARM ranked purple, orange, blue or white, or non-CHARM A, B or C ranked chemicals). There is a preference for chemical options that are CHARM ranked Gold/Silver, or non-CHARM ranked E/D chemicals and chemicals that have a low aquatic toxicity, are readily biodegradable and do not bioaccumulate (discussed below).

Any chemicals that may be discharged to the marine environment and not OCNS CHARM or non-CHARM ranked are risk assessed using the OCNS CHARM or non-CHARM models. The chemical is assigned a pseudo-ranking based on the available aquatic toxicity, biodegradation, and bioaccumulation data (discussed below) and assessed for environmental acceptability for discharge to the marine environment.

2.11.1 Ecotoxicity Assessment

Table 2-2 and Table 2-3 act as guidance in assessing the ecotoxicity of chemicals during the investigation of potential alternatives. Table 2-2 is used by Cefas to group a chemical based on ecotoxicity results, 'A' representing highest toxicity/risk to environment and 'E' lowest. Table 2-3 shows classifications/categories of toxicity against aquatic toxicity results.

Table 2-2: Initial Offshore Chemical Notification Scheme Ranking

Initial Grouping	A	B	C	D	E
Result for aquatic-toxicity data (ppm)	<1	≥1–10	>10–100	>100–1,000	>1,000
Result for sediment-toxicity data (ppm)	<10	≥10–100	>100–1,000	>1,000–10,000	>10,000

Note: Aquatic toxicity refers to the Skeletonema costatum *EC50,* Acartia tonsa *LC50, and* Scophthalmus maximus *(juvenile turbot) LC50 toxicity tests. Sediment toxicity refers to the* Corophium volutator *LC50 test.*

Source: Cefas Standard Procedure 2019, OCNS 011 NL Protocol PART 1: Core Elements

Table 2-3: Aquatic Species Toxicity Grouping

Category	Species	LC_{50} and EC_{50} Criteria
Category Acute 1 Hazard statement – Very toxic to aquatic life	Fish	LC_{50} (96hr) of ≤1 mg/L
	Crustacea	EC_{50} (48hr) of ≤1 mg/L
	Algae/other aquatic plant species	ErC_{50} (72 or 96hr) of ≤1 mg/L
Category Acute 2 Hazard statement – Toxic to aquatic life	Fish	LC_{50} (96hr) of >1 mg/L to ≤10 mg/L
	Crustacea	EC_{50} (48hr) of >1 mg/L to ≤10 mg/L
	Algae/other aquatic plant species	ErC_{50} (72 or 96hr) of >1 mg/L to ≤10 mg/L
Category Acute 3 Hazard statement – Harmful to aquatic life	Fish	LC_{50} (96hr) of >10 mg/L to ≤100 mg/L
	Crustacea	EC_{50} (48hr) of >10 mg/L to ≤100 mg/L
	Algae/other aquatic plant species	ErC_{50} (72 or 96hr) of >10 mg/L to ≤100 mg/L

2.11.2 Biodegradation Assessment

The biodegradation of chemicals is assessed using the Cefas biodegradation criteria, which aligns with the categorisation outlined in the United Nations GHS Annex 9 Guidance on Hazards to the Aquatic Environment (2019). The below is used as a guide during the investigation of potential chemical alternatives. Preference is to select readily biodegradable chemicals.

Cefas categorises biodegradation into the following groups:

a) readily biodegradable: results of >X% biodegradation in 28 days to an OSPAR harmonised offshore chemical notification format (HOCNF) accepted ready biodegradation protocol

b) moderately biodegradable: results >20% and <X% to an OSPAR HOCNF accepted ready biodegradation protocol

c) poorly biodegradable: results from OSPAR HOCNF accepted ready biodegradation protocol.

Where X is equal to:

- 60% in 28 days in OECD 306, Marine BODIS or any other acceptable marine protocols, or in the absence of valid results for such tests
- 60% in 28 days (OECD 301B, 301C, 301D, 301F, Freshwater BODIS), or
- 70% in 28 days (OECD 301A, 301E).

2.11.3 Bioaccumulation Assessment

The bioaccumulation of chemicals is assessed using the Cefas bioaccumulation criteria, which aligns with the categorisation outlined in the United Nations GHS Annex 9 Guidance on Hazards to the Aquatic Environment (2019). Preference is to select non bio accumulative chemicals.

The following guidance is used by Cefas:

a) non-bio accumulative/non-bioaccumulating: Log Pow <3, or results from a bioaccumulation test (preferably using *Mytilus edulis*) demonstrates a satisfactory rate of uptake and depuration, and the molecular mass is ≥700.

b) bio accumulative/Bioaccumulates: Log Pow ≥3, or results from a bioaccumulation test (preferably using *Mytilus edulis*) demonstrates an unsatisfactory rate of uptake and depuration, and the molecular mass is <700.

All chemicals will be selected in accordance with the Santos Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001), as applicable.

2.12 Post Preservation

Santos is currently assessing two re purposing options for the Reindeer facility, reuse of the DC supply pipeline for CCS or use of the Reindeer facility and DCGP for processing hydrocarbons from the Corvus field.

2.12.1 Reindeer CCS

The Reindeer CCS project would involve repurposing the DC supply pipeline to transport CO_2 from customers to the Reindeer field subject to regulatory approvals and customers projects progress.

In support of this project Santos signed a Memorandum of Understanding (MoU) with proponent to develop a carbon sequestration project for an ammonia facility in the Pilbara near Karratha by re-using Devil Creek and Reindeer facilities to permanently sequester CO_2 in the Reindeer reservoir.

The estimated dates for CCS final investment decision (FID) is 2025 and execution 2028.

2.12.2 Corvus project

Santos is currently in the Concept Select phase for the development of the Corvus field (WA-45-R) located in the Northern Carnarvon basin. Several development concepts are being investigated during this phase, including the option to utilise the DCGP for the onshore processing of hydrocarbons. This option would transport the hydrocarbons from the Corvus field via the DC supply pipeline to the DCGP for processing. The assessment of this as a feasible option is ongoing. The feasibility of this option is subject to ongoing work.

2.12.3 Interrelationship between CCS and decommissioning

Reindeer CCs and the Corvus projects are being assessed as reuse options for the Reindeer and Devil Creek facility post the preservation phase. Santos is also concurrently planning for decommissioning the Reindeer facility as per NOPSEMA Policy 'Section 572 Maintenance and removal of property'.

While Santos is assessing repurposing options for the Reindeer facility post preservation, decommissioning is being progressed in parallel as a distinct project.

A summary of proposed timelines, tasks and milestones for planning for decommissioning is provided in Table 2-4. The decommissioning timelines also take the timelines for the repurposing options into account.

Table 2-4: Planning for decommissioning

Timeframes	Tasks and Milestones
2025-2029	• Engineering and scientific studies for decommissioning (Section 2.13.4)
2026-2027	• P&A EP
2024-2029	• Assessment of the decommissioning options.
2027-2028	• Decommissioning EP to be prepared. Including stakeholder consultation with relevant persons for the decommissioning activities.
2030-2032	• If CCS does not proceed, offshore decommissioning execution shall occur (in accordance with an accepted decommissioning environment plan) to meet the requirements of Section 572. The timeframe represents a period in which the task may occur within and may not represent the duration.
Notes: Dates in this table are estimates only.	

2.13 Planning for Decommissioning

As outlined in Section 2.10 Santos is planning for the future decommissioning or repurposing, of the Reindeer facilities.

Decommissioning is not an activity performed within the scope of this EP, however, is described to provide context for Santos' planning for future phases.

- provides an overview of the key decommissioning legislation and guidelines driving the planning for decommissioning.
- Santos' decommissioning planning activities in accordance with NOPSEMA Decommissioning Compliance Strategy 2024–2029 is outlined in Section 2.13.3**.**

2.13.1 Regulatory Context

The NOPSEMA planning for proactive decommissioning document (N-00500-IP2002), states that decommissioning is taken to mean the process of removing or otherwise satisfactorily dealing with offshore petroleum property (including wells) in a safe and environmentally responsible manner when it is neither used nor intended to be used.

Decommissioning in Commonwealth waters is governed by a series of legislation, policies and standards. The OPGGS Act is the primary legislation governing offshore decommissioning in Commonwealth waters. NOPSEMA lists multiple documents it considers relevant to decommissioning, including but not limited to the following:

- NOPSEMA Information paper: Planning for proactive decommissioning (N-00500-IP2002 A816565).
- NOPSEMA Policy: Section 572 Maintenance and removal of property (N-00500-PL1903 A720369).
- NOPSEMA policy Section 270 Consent to surrender title – NOPSEMA advice (N-00500-PL1959 A800981).

NOPSEMA Information paper – planning for proactive decommissioning

The NOPSEMA planning for proactive decommissioning document (N-00500-IP2002) states the following key points:

- The safe and environmentally responsible decommissioning of property is a key objective that titleholders shall plan for over all stages of the life cycle of a petroleum project to ensure compliance with the OPGGS Act and OPGGS(E)R.
- Titleholders are required under section 572(2) and (3) of the OPGGS Act to maintain property brought onto the area of a title and to remove that property when it is no longer in use or to be used.
- Consideration of alternative end state outcomes are subject to other provisions of the OPGGS Act and Regulations and provided for under section 572(7). Further, section 270(3)(c) to (f) requires titleholders to meet obligations with respect to property and the environment to the satisfaction of NOPSEMA in support of consent to surrender title.
- Planning for proactive decommissioning should be focused upon the outcomes required to comply with section 572 and then satisfy NOPSEMA for the purpose of 270(3)(c) to (f) of the OPGGS Act. The criteria and obligations required in order to comply should be included in the final permissioning documents and accepted by NOPSEMA prior to the commencement of final decommissioning activities.

NOPSEMA Policy – Section 572 maintenance and removal of property

The NOPSEMA Section 572 Maintenance and removal of property policy (N-00500-PL1903 A720369) sets out the principles that NOPSEMA will apply in the administration of section 572 of the OPGGS Act which requires titleholders to:

- maintain all structures, equipment and other property in a title area in good condition and repair
- remove all structures, equipment and other property that is neither used nor to be used in connection with operations authorised by the title; or
- make arrangements that are satisfactory to NOPSEMA in relation to those structures, equipment and other property.

Table 2-5: Duties and requirements under section 572

Section of Act	Duties and Requirements
Maintenance of property etc. (section 572(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 b. used in connection with the operations authorised by the permit, lease, licence or authority.
Removal of property etc. (section 572(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 which the titleholder is or will be engaged b. that are authorised by the permit, lease, licence or authority.
Exception to the requirement (section 572(6))	Section 572(6) provides that maintenance and removal requirements, “do not apply in relation to any structure, equipment or other property that was not brought into the title area by or with the authority of the titleholder”. Where a title has been sold or transferred (change in control), the requirement to maintain and remove property etc. remains with the titleholder, whether it is operational or not. Where property etc. remains within a title and the title has ceased to be in force (i.e. for a

Section of Act	Duties and Requirements
	period of time an area has reverted to vacant acreage), the current titleholder may not be responsible for any property etc. in the area of the title resulting from historical activities of the former titleholder if that property etc. is not being used. It should be noted, where a title ceases to be in force, in whole or in part, NOPSEMA may still direct the titleholder, former titleholder or certain other persons, under section 587 of the OPGGS Act to remove or make arrangements with respect to property etc.
Obligations of maintenance and removal of property etc. are subject to other provisions (section 572(7))	Section 572(7) of the OPGGS Act allows for titleholders to make other arrangements that are satisfactory to NOPSEMA with respect to property etc. for the purposes of section 270 of the OPGGS Act via an accepted permissioning document. Other arrangements in the context of this regulatory policy include where a titleholder intends to do something that is different from the requirements of section 572(2) and (3). Maintenance and removal of property etc. requirements are subject to other provisions of the OPGGS Act, the regulations, directions given by NOPSEMA or the responsible Commonwealth Minister, and any other law. The maintenance and removal requirements do not substitute for, or override other provisions of, or arrangements made under, the OPGGS Act or regulations. If a titleholder intends to make other arrangements in relation to property etc. under section 572(7), the proposed approach should be included in permissioning documents and accepted by NOPSEMA prior to the property etc. being brought into the title area. Any changes in the titleholders' approach should be addressed in subsequent revisions of permissioning documents.

NOPSEMA Policy –- Section 270 consent to surrender title

The NOPSEMA policy Section 270 Consent to surrender title – NOPSEMA advice (Document No: N-00500-PL1959 A800981) states the following key points:

- Section 270 of the OPGGS Act provides that the Joint Authority (JA) may consent to the surrender of petroleum exploration permits, production licences, retention leases, infrastructure licences and pipeline licences, if it is satisfied there are sufficient grounds to warrant giving consent.
- NOPSEMA will be requested to provide advice to the JA in relation to certain criteria to inform the JA's decision-making.
- NOPSEMA's advice will be based upon performance against conditions and obligations set out in permissioning documents.

Santos acknowledges the requirement of Section 270 but notes that Section 270 matters are not addressed within this EP and are therefore not discussed further. Section 270 matters will be the subject of a future decommissioning EP.

NOPSEMA Decommissioning Compliance Strategy 2024–2029

NOPSEMA's vision is that decommissioning of offshore petroleum wells, structures and property is completed in a timely, safe and environmentally responsible manner. Santos Decommissioning Plan for the Reindeer facility was submitted to NOPSEMA in Q3 2023. Santos proposed schedule for future decommissioning activities is outlined in Section 2.13.3.

2.13.2 Santos Decommissioning Objectives

Santos' planning for decommissioning includes the following objectives:

- Ensure studies are conducted to understand the potential decommissioning options and environmental risks.
- Maintain all structures, equipment and other property in a title area in good condition and repair.
- Ensure the outcomes comply with section 572 and 270 of the OPGGS Act, and other relevant legislation and guidance material.

2.13.3 Santos Decommissioning Plan

Recently Santos has completed significant work on its long term decommissioning plan across Commonwealth and State waters. The decommissioning plan ensures we are carrying out activities at an appropriate time when taking into consideration risk, environmental and safety benefits. This stable long term plan of activity allows for effective resourcing, skills development and financing, allowing for learnings to be applied to ensure the safe execution of all campaigns.

Santos acknowledges NOPSEMA's Decommissioning Compliance Plan and Strategy which aims to ensure titleholders have appropriate plans for decommissioning and are completing activities in a timely manner. The proposed schedule is committed to ensuring that all our facilities are in safe condition and do not pose a threat to people, the environment or property, and is aligned with NOPSEMA's vision of decommissioning being completed in a timely, safe, and environmentally responsible manner.

Santos has split planning for each execution area into two main packages. Noting they may be split into further sub-packages for contracting requirements:

- Package 1: Care and Maintenance
- Package 2: Well Plug and Abandonment (Future EP)
- Package 3: WHP and Pipeline Decommissioning (Future EP)

The below schedule summarises the forward plan decommissioning of the Reindeer facility:

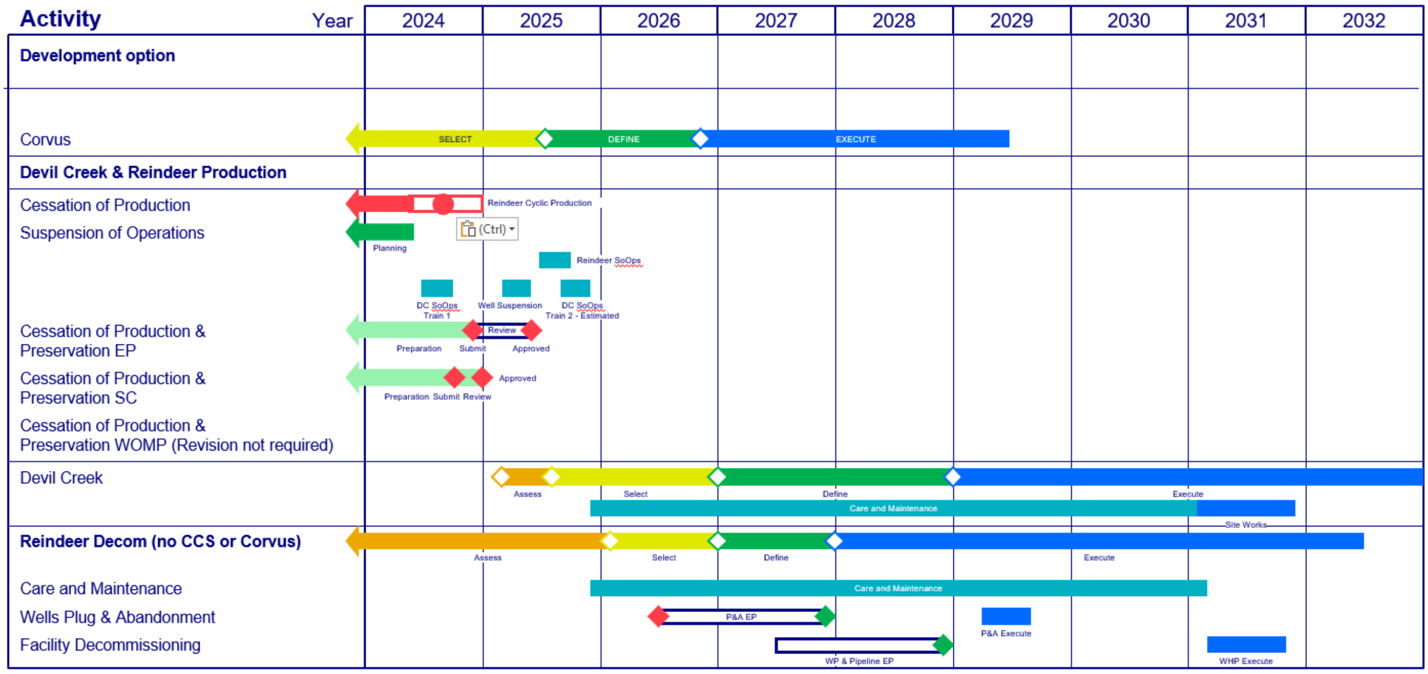

Figure 2-4:Decommissioning plan for Reindeer facility

Planning for all execution activities starts well in advance of any execution activities. This allows sufficient time for EP submission and approvals and awarding of key contracts post EP approval and package Final Investment Decisions (FID).

The environmental approvals associated with the decommissioning packages are outlined below:

Package 1: Care and maintenance.

Care and maintenance is addressed in this EP. It includes CoP and preservation activities'

Package 2: Well plug and abandonment

A plug and abandonment EP will be submitted to NOPSEMA which addresses the following:

- Description of all property brought onto title including its current status and condition
- A description of all activities associated with plugging and abandonment of all wells on title
- Details plans of P&A activities and execution timings

Package 3 WHP and pipeline decommissioning

A WHP and pipeline decommissioning EP will be submitted to NOPSEMA which addresses the following:

- detailed plans of the proposed subsea decommissioning activities. In particular, the fate of all property on the title, proposed decommissioning methodology, scope of work and execution strategy

- Santos acknowledges that where a decision to pursue a deviation to the base case of full removal is proposed, the EP must demonstrate that a deviation delivers equal or better environmental outcomes compared to complete property removal
- an evaluation of the feasibility of all options, including partial and complete property removal
- an evaluation of environmental impacts and risks of all feasible options, including complete property removal, to enable NOPSEMA to have regard to the Australian Government Decommissioning Guideline policy principle that deviations will provide an equal or better environmental outcome when compared to complete property removal. The evaluation of all the environmental impacts and risks of each option must include consideration of control measures necessary to manage the impacts and risks
- evaluation of all environmental impacts and risks within Australia's environment including, where relevant, indirect consequences that may arise from the petroleum activity of removing property from a title area
- where deviation/s to removal of property or relocation of property is proposed, Santos will address arrangements for monitoring and management

2.13.4 Studies

Various technical and environmental studies may be undertaken to support decommissioning as outlined in Table 2-6.

Table 2-6: Studies proposed to support decommissioning

Category	Year	Scope / Purpose
Pipeline Degradation		
Degradation	2025-2028	An evaluation of the degradation timeline for the Pipeline based on in-situ decommissioning.
Contaminants		
Contaminant characterisation	2025–2028	Radiological monitoring, analysis of the radiological contaminants present.
Snagging		
Snagging and protection	2025–2028	Snagging associated with the in-situ decommissioning of the Pipeline.
Habitats		
ROV footage of Pipeline habitats	2025–2028	To evaluate the potential options for ROV footage assessments.
Decommissioning Options		
Decommissioning options evaluation	2025–2028	This report provides a desktop overview of environmental and societal features and characteristics
Environmental Sampling		
Environmental Sampling if required	Potentially during 2025–2028	To obtain sediment and environmental samples from the Operational Area, if required.

2.13.5 Maintaining Property to Enable Decommissioning

As per the NOPSEMA Policy N-00500-PL1903 A720369 (Section 572 Maintenance and removal of property), when planning for any alternative arrangement to removal of property etc. a titleholder must continue to maintain property etc. in good condition and repair so that it can be removed, until alternative arrangements are accepted by NOPSEMA.

During both the Operation and CoP phases, Santos will ensure through IMMR and integrity management activities (as described in Section 2) that all property is maintained in a state that ensures it can be removed safely at the end of its life, or an alternate end state agreed.

A Well Operations Management Plan (WOMP) will be implemented throughout the CoP phase. The WOMP describes how the wells are managed including inspection, maintenance and repair activities. It also covers emergency situations. These measures are intended to ensure integrity of the wells and ensure that risks to personnel and the environment are as low as reasonably practicable (ALARP).

3. Description of the environment

OPGGS(E)R 2023 Requirements
Regulation 21(2)
The environment plan must: a) describe the existing environment that may be affected by the activity; and b) include details of the relevant values and sensitivities (if any) of that environment. Note: The definition of ***environment*** in section 5 includes its social, economic and cultural features.
Regulation 21(3)
Without limiting paragraph (2)(b), relevant values and sensitivities may include any of the following: a) the world heritage values of a declared World Heritage property; b) the National Heritage values of a National Heritage place; c) the ecological character of a declared Ramsar wetland; d) the presence of a listed threatened species or listed threatened ecological community; e) the presence of a listed migratory species; f) any values and sensitivities that exist in, or in relation to, part or all of: (i) a Commonwealth marine area; or (ii) Commonwealth land.

3.1 Environment that may be affected (EMBA)

This section summarises the key physical, biological, socio-economic and cultural characteristics of the existing environment that may be affected by the activity, both from planned and unplanned events associated with the activity. The description of the environment applies to two areas:

- The operational area Figure 2-2
- The environment that may be affected (EMBA), shown in Figure 3-1.

3.1.1 Determining the EMBA

Stochastic hydrocarbon dispersion and fate modelling was undertaken for the worst-case credible spill scenarios (defined in Section 7.5). Stochastic modelling is created by overlaying 150–300 individual hypothetical oil spill simulations from an oil spill into a single map, with each simulation subject to a different set of metocean conditions drawn from historical records. Stochastic modelling is completed to reduce uncertainty in risk assessment and spill response planning may not represent the actual path that an actual spill could take.

To ensure a representative EMBA was correctly assessed in this EP, the EMBA for all of the modelled worst-case scenarios (e.g. loss of well control and vessel collision) were combined to create a single EMBA representing the greatest spatial extent.

The modelling considered four key physical or chemical phases of hydrocarbons that pose differing environmental and socioeconomic risks: surface, entrained, dissolved aromatic and shoreline accumulated hydrocarbons. The modelling used defined hydrocarbon exposure values for each hydrocarbon phase, as relevant, to identify an area that might be contacted by hydrocarbons, and to inform the environment risk assessment and oil spill response planning. The three exposure values used were:

- the low exposure values to define the EMBA
- the moderate exposure values to define the moderate exposure value area (MEVA)
- the high exposure values to define the high exposure value area (HEVA).

Refer to Table 3-1 for the exposure values used, Figure 3-1 for their spatial extent, and to Section 7.5.5 for further information on the reasons why these exposure values were selected and how they relate to the risk assessment.

The EMBA is based on stochastic modelling, using the low exposure values. The EMBA encompasses the outer most boundary of the overlaid worst-case spatial extent of the four hydrocarbon phases listed above for the worst-case credible spill scenarios and as such, encompasses the full range of environmental receptors that might be contacted by hydrocarbons in the highly unlikely event of a worst-case hydrocarbon spill (from a loss of well control or vessel collision). Most planned and unplanned events associated with the activity may affect the environment up to a few kilometres from the operational area e.g. from noise impacts. A large unplanned hydrocarbon spill would extend substantially beyond this (Section 7.5).

The low exposure values used to set the outer boundaries of the EMBA are not expected to result in ecological impacts. The low exposure value for surface hydrocarbons represents a visible oil (rainbow) sheen and has been used to provide an indication of the extent to which other marine users may visually observe oil on the sea surface. This is considered to provide a conservative extent of potential impacts to other marine users. Biological impacts may occur within the moderate exposure value area (MEVA) and high exposure value area (HEVA), both of which represent a subset of the EMBA. Consequently, the evaluation of potential environmental consequences of a hydrocarbon release (impact assessment) were based on the MEVA and HEVA. Refer to Section 7.5.5 for further information on the spill trajectory modelling thresholds that have been selected.

Table 3-1: Hydrocarbon exposure values of the environment that may be affected

Hydrocarbon Phase	Exposure Value		
	Low	Moderate	High
Surface (g/m^2)	1	10	50
Shoreline accumulation (g/m^2)	10	100	1,000
Dissolved aromatics (ppb)	10	50	400
Entrained (ppb)	1,000	1,000	-

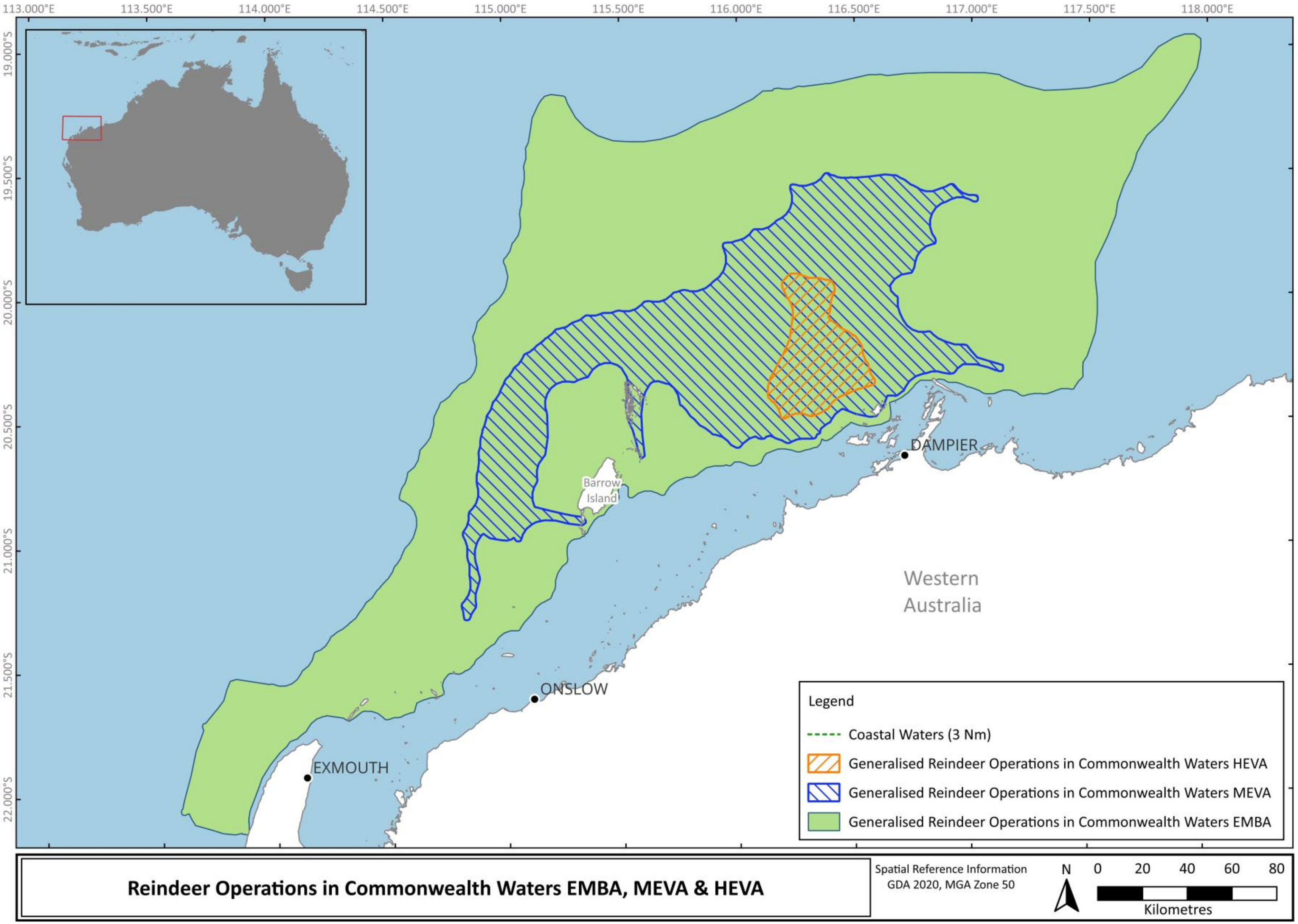

Figure 3-1: EMBA, MEVA and HEVA for Reindeer Operations

3.2 Environmental values and sensitivities

This section summarises environmental values and sensitivities, including physical, biological, socio-economic and cultural features in the marine and coastal environment that are relevant to the operational area and the EMBA.

A comprehensive description of the environmental values and sensitivities of the existing environment within the operational area and the EMBA is provided in Appendix C.

3.2.1 Protected Matters Search Tool

Protected Matters Search Tool (PMST) searches were undertaken in March and April 2024 on the operational area, the MEVA, the HEVA, and the EMBA. The PMST searches were completed using the exact co-ordinates that are used to produce the figures throughout Section 2.13, ensuring the EMBA encompasses the full range of environmental receptors that might be contacted by surface and subsurface hydrocarbons at the low exposure level, in the highly unlikely event of a worst-case oil spill.

3.2.2 Physical Environment

A detailed oil spill modelling study which assessed the risk and potential exposure to the surrounding waters was commissioned by Santos and undertaken by RPS (RPS 2024). An extensive selection of physical environment properties were used as inputs in a three- dimensional oil spill model to simulate the drift, spread, weathering and fate of the spilled oil. A summary is provided below and more details can be found in *Santos Reindeer Hydrocarbon Spill Modelling Report* (RPS 2024).

3.2.2.1 Currents

The area of interest for this study is typified by strong tidal flows over the shallower regions, particularly along the inshore region of the Northwest Shelf and among the island groups stretching from the Dampier Archipelago to the Northwest Cape (Figure 3-2, adapted from DEWHA, 2008). However, the offshore regions with water depths exceeding 100–200 m experience significant large-scale drift currents. These drift currents can be relatively strong (1–2 knots) and complex, manifesting as a series of eddies, meandering currents, and connecting flows. These offshore drift currents also tend to persist longer (days to weeks) than tidal current flows (hours between reversals) and thus will have greater influence upon the net trajectory of slicks over time scales exceeding a few hours.

Wind shear on the water surface also generates local-scale currents that can persist for extended periods (hours to days) and result in long trajectories. The tidal currents are generally weaker in the deeper waters, their influence is greatest along the near shore, coastal passage regions and, in and around islands.

At the WHP, the average and maximum surface current speeds were 0.30 m/s and 2.51 m/s, respectively. The general annual current directions were tidally dominated and flow along the southeast – northwest axis.

The average and maximum surface current speeds at the Commonwealth State Boundary (CSB) were 0.23 m/s and 1.35 m/s, respectively, with variable current directions.

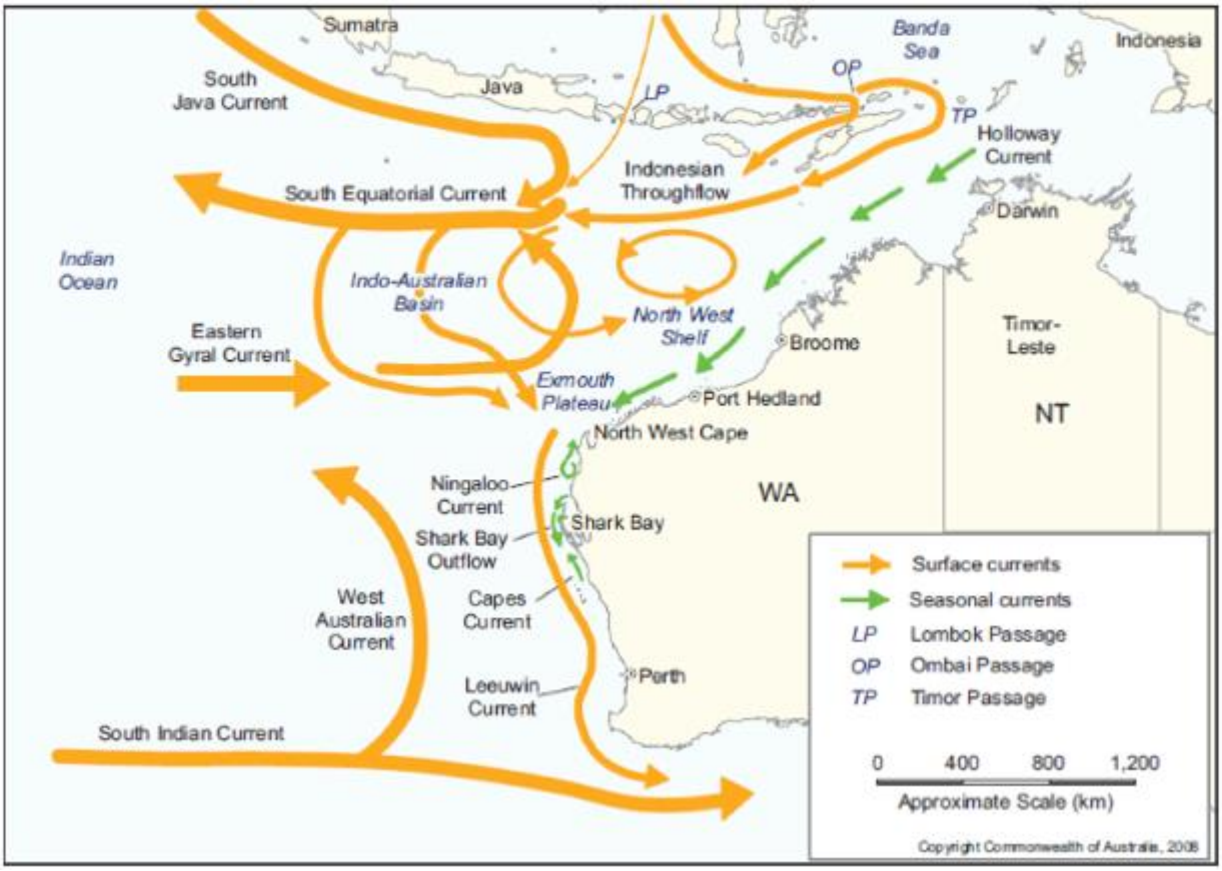

Figure 3-2: Schematic of ocean currents along the Northwest Australian continental shelf.

3.2.2.2 Wind

To account for the influence of the wind on the floating oil, wind data from 2010–2019 (inclusive) were sourced from the National Centre for Environmental Prediction (NCEP) Climate Forecast System Reanalysis (CFSR; see Saha et al., 2010). The CFSR wind model includes observations from many data sources; surface observations, upper-atmosphere air balloon observations, aircraft observations and satellite observations.

The region experiences predominantly moderate winds throughout the year, with average and maximum wind speeds ranging from 11.7–52.3 knots, respectively. In the summer months (October to March), the prevailing winds are from the west. Conversely, during winter (May to August), the winds predominantly originate from the east-southeast and tend to be notably stronger. Transitional months exhibit a more variable wind directionality.

3.2.2.3 Water Temperature and Salinity

The monthly depth-varying water temperature and salinity profiles adjacent to the WHP and (CSB) locations were obtained from the World Ocean Atlas 2018 database produced by the National Oceanographic Data Centre (National Oceanic and Atmospheric Administration) and its co-located World Data Centre for Oceanography (Levitus et al., 2013). The data was used by RPS in their modelling to inform the weathering, movement and evaporative loss of hydrocarbon spills in the surface and subsurface layers.

Table 3-2 shows that the monthly average sea surface (up to 5 m depth) temperatures and salinity adjacent to the release locations. Surface temperatures were similar at all locations ranging from 24.5 °C (August to October; nearby the CSB) to 29.3 °C (March; nearby the WHP). Salinity remained consistent throughout the year ranging between 34.6 ppt (November; near the CSB) and 35.5 ppt (May; near the CSB).

Table 3-2: Monthly average sea surface temperature and salinity in the 0-5 m depth layer adjacent to the WHP and CSB release locations

Location	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
WHP	Temperature (°C)	27.2	28.5	29.3	28.5	27.3	26.1	25.3	24.6	25.1	25.3	26.8	26.9
	Salinity (psu)	35.3	35.2	35.3	35.4	35.1	35.1	35.0	35.0	35.1	35.0	34.7	35.2
CSB	Temperature (°C)	27.1	28.4	29.1	28.3	27.3	25.8	25.2	24.5	24.6	24.9	26.7	26.8
	Salinity (psu)	35.4	35.3	35.4	35.5	35.5	35.3	35.1	35.0	35.2	35.0	34.6	35.2

3.2.3 Bioregions

Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA), Version 4.0 (Department of Environment and Heritage (DEH), 2006), the regional descriptions relevant to the operational area and the EMBA are provided in Table 3-3.

Table 3-3: Integrated Marine and Coastal Regionalisation of Australia 4.0 provincial bioregions relevant to the activity

Bioregion	Operational Area	EMBA
North West Marine Region		
Northwest Province	×	✓
Northwest Shelf Province	✓	✓
Northwest Transition	×	✓
Central Western Transition	×	✓
Central Western Shelf Transition	×	✓

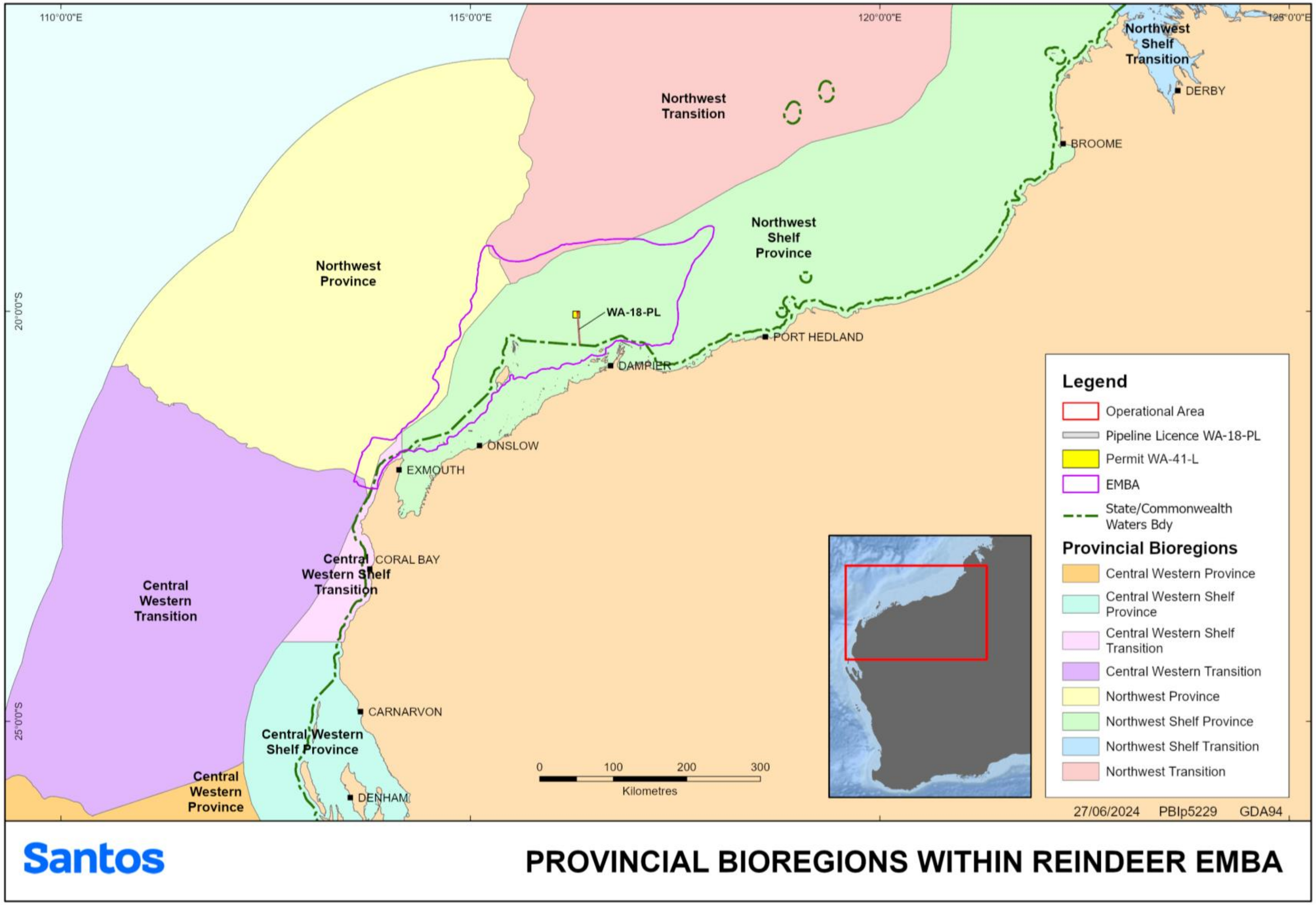

Figure 3-3: Provincial bioregions within the EMBA

3.2.4 Benthic habitats

3.2.4.1 Operational area

The operational area does not contain any shoreline habitat. The nearest landmasses are the Montebello Islands, Dampier Archipelago and Barrow Island, located ~55 km, 30 km and 80 km from the operational area, respectively.

The predominant habitat type in the operational area is soft unconsolidated sediments (RPS, 2008). Benthic primary producer habitat (e.g. areas of hard corals, seagrass or macroalgae) is unlikely to be present in the operational area, given that the water depths range between ~38 and 58 m (NGI, 2018). Benthic primary production at these depths are limited due to insufficient light availability (RPS, 2008).

A detailed marine survey of the seabed along the DC supply pipeline alignment and at the WHP location was performed in October 2007 (RPS, 2008). This survey described the benthic communities at the seabed at a number of sites spanning the Reindeer facilities.

The deepest areas investigated, approximately between 45 and 60 m water depth, comprised mainly medium -to -coarse sands and generally supported low -diversity communities, with sparse benthic and epibenthic (living on the surface of sediments) organisms that included sea pens (sometimes quite dense), heart urchins, and very occasional crinoids and bryozoans. The fine -to -medium sand habitats were characterised by a higher level of bioturbation than was evident in the coarser sediments. The epibenthic fauna characteristics of the deep areas suggest the presence of a deep sand layer without pavement close to the surface.

Between 43 and 47 m water depth, the substrate was again dominated by mostly bare medium -to -coarse sands, with limited benthic (living on the seafloor) faunal communities. There were occasional emergent areas of rock pavement. The hard substrates were colonised by a more diverse community, including occasional sea whips, sponges, gorgonians, sea pens and crinoids in low densities. Species diversity and density appeared to relate mainly to sediment stability and seabed profile, with the higher profile features supporting more abundant and diverse communities than the lower pavements and bare sandy areas. Bare sands were bioturbated (mixed) by infauna (living within the sediment), but very few organisms were seen over pavement areas other than the occasional schooling fish and a sea snake.

Further exposed rock pavement, isolated small surface rocks and pavement overlain with thin sand veneers were identified between 50 and 51 km offshore in 41 m water depth. This area was mostly bare rock and sand apart from occasional sponges and fish near the rocks. The rock pavement extended into areas previously described as medium-to-coarse and coarse gravelly sands. These areas were characterised by occasional sponges, crinoids, hydroids, sea whips, ascidians, isolated patches of gorgonian fans, very occasional sea stars and bare bioturbated sands.

3.2.4.2 EMBA

Within the EMBA, the subtidal benthic habitats in the wider Northwest Shelf Province include coral reefs, macroalgae, seagrasses, hard substrates and supported assemblages, and soft sediments and associated benthic fauna. Habitats along the DC supply pipeline route described by RPS (2008) are likely to be representative of areas at similar depths within the EMBA (Section 3.2.3) and are discussed below.

Bare bioturbated sands extend inshore along the DC supply pipeline route and are the dominant feature between 33 and 44 km offshore (30–37 m water depth). Very occasional crinoids and hydroids were observed, with occasional macroalgae in the shallower water.

Multiple large rock and coral bomboras (isolated reef structure), surrounded by exposed rock pavement with sand veneers and areas of bare sand, were identified between 29 and 33 km offshore (26–30 m water depth), mainly west of the centreline of the DC supply pipeline corridor. The coral bomboras ranged in height from 1 m to 6 m and were dominated by large plating *Pachyseris* species (Plate 3-1). Dense schooling reef fish and pelagic (found in open water) fish were associated with areas of high coral cover.

Rock pavement areas surrounding the coral bomboras support medium-to-high density sponges and macroalgae, including the algae genera *Dictyopteris* and *Caulerpa*. Bare sand areas support the growth of low-to-medium density seagrass (*Halophila*), *Caulerpa* and *foraminiferans*.

A low-profile rock pavement ridge was identified running approximately east–west between 21 and 23 km offshore (~22 to 26 m water depth). This ridge area was characterised by exposed limestone rock pavement dominated by macroalgae, with sponges, corals and gorgonians. The corals included *Porites* and *Turbinaria*. Small numbers of ascidians and sea whips were also present. An additional area containing coral bomboras up to 1.5 m high was identified east of the corridor centreline between 22 and 20 km offshore. The dominant feature at this site was the surrounding rock pavement with sand veneers, macroalgae and minor small corals, including *Acropora*, *Turbinaria* and *Porites*.

The dominant substrate from 15–20 km offshore (~9–22 m depth) was bare coarse sand of unknown depth. Between 15 and 10 km offshore (~22–9 m depth), rock pavement with sand veneers was again the dominant feature, the pavement supporting the growth of macroalgae (mostly *Asparagopsis* and *Dictyopteris*), minor sponges, sea whips, gorgonians, and occasional crinoids, ascidians and corals, including *Turbinaria* and *Porites* (Plate 3-2). Occasional sea stars and heart urchins were also observed.

The zone between 2 and 10 km offshore (4–9 m in depth) was a mixture of bare sand patches with medium-to-coarse grains and exposed pavement with sand veneers. The bare sand areas supported medium-to-dense patches of heart urchins and areas of minor bioturbation. The pavement areas had minor to moderate macroalgal cover, including *Dictyopteris*, *Asparagopsis* and occasional patches of *Padina* and *Udotea*, as well as small corals, gorgonians and occasional sponges. The number of coral species and coral cover increased slightly as the depth decreased towards the shore, along with the occurrence of isolated coral bomboras and coral patches (Plate 3-1 to Plate 3-3). Medium-density patches of seagrass were also observed between the areas of pavement (Plate 3-4).

In the Pilbara region, within the EMBA, the coast is a complex of deltas, limestone barrier islands and lagoons, with a variable suite of substrates. As a result, mangroves in this region form relatively diverse fringing stands, albeit often stunted in stature but at times quite extensive in area. The mangroves along the Pilbara coastline are the largest single unit of relatively undisturbed tropical arid zone habitats in the world. The area has nine mangrove taxa and a total of 632 km^2 mangroves (MangroveWatch 2013). As with most arid zone mangroves, Pilbara mangroves are characterised by open woodlands and shrublands that are of relatively lower productivity than the mangrove communities of the wet tropics because of the extreme water and salinity stresses that affect the intertidal zone in the Pilbara (EPA 2001).

Mangroves commonly occur in sheltered coastal areas in tropical and sub-tropical latitudes (Kathiresan and Bingham, 2001). Up to eight species of mangroves are found further north in the Central Western Shelf Transition region, within the EMBA, but at most locations the dominant mangrove (in terms of area of intertidal zone occupied) is *Avicennia marina*, with the stilt rooted mangrove *Rhizophora stylosa* often occurring as thin zones of dense thickets within the broad zone of *A. marina*. Mangroves are found wherever suitable conditions are present including wave dominated settings of deltas, beach/dune coasts, limestone barrier islands and ria/archipelago shores (Semeniuk 1993). Mangrove plants have evolved to adapt to fluctuating salinity, tidal inundation and fine, anaerobic, hydrogen sulfide rich sediment (Duke et al,. 1998).

Sandy habitats are important for both resident and migratory seabirds and shorebirds and occur throughout the EMBA on offshore islands. Rocky shorelines are found across the EMBA and are often indicative of high energy areas (wave action) where sand deposition is limited or restricted (perhaps seasonally or during a cyclone). They are formed from limestone pavement extending out from the beach into subtidal zones, for example along the Ningaloo Coast and North West Cape; higher relief platforms (>0.5 m off high water mark) are also present at a number of headlands along the North West Cape.

Rocky shores can include pebble/ cobble, boulders, and rocky limestone cliffs (often at the landward edge of reef platforms). Rocky outcrops typically consist of hard bedrock, but some of the coastline has characteristic limestone karsted cliffs with an undercut notch. Rocky shorelines can vary from habitats where there is bedrock protruding from soft sediments to cliff like structures that form headlands. Rocky shorelines are an important foraging area for seabirds and habitat for invertebrates found in the intertidal splash zone (Jones, 2004).

Plate 3-1: Plating *Pachyseris* on large coral bombora

Plate 3-2: Sandy pavement with *Asparagopsis* and sponges

Plate 3-3: Patch coral reef with macroalgae

Plate 3-4: Medium- to high-density seagrass meadow

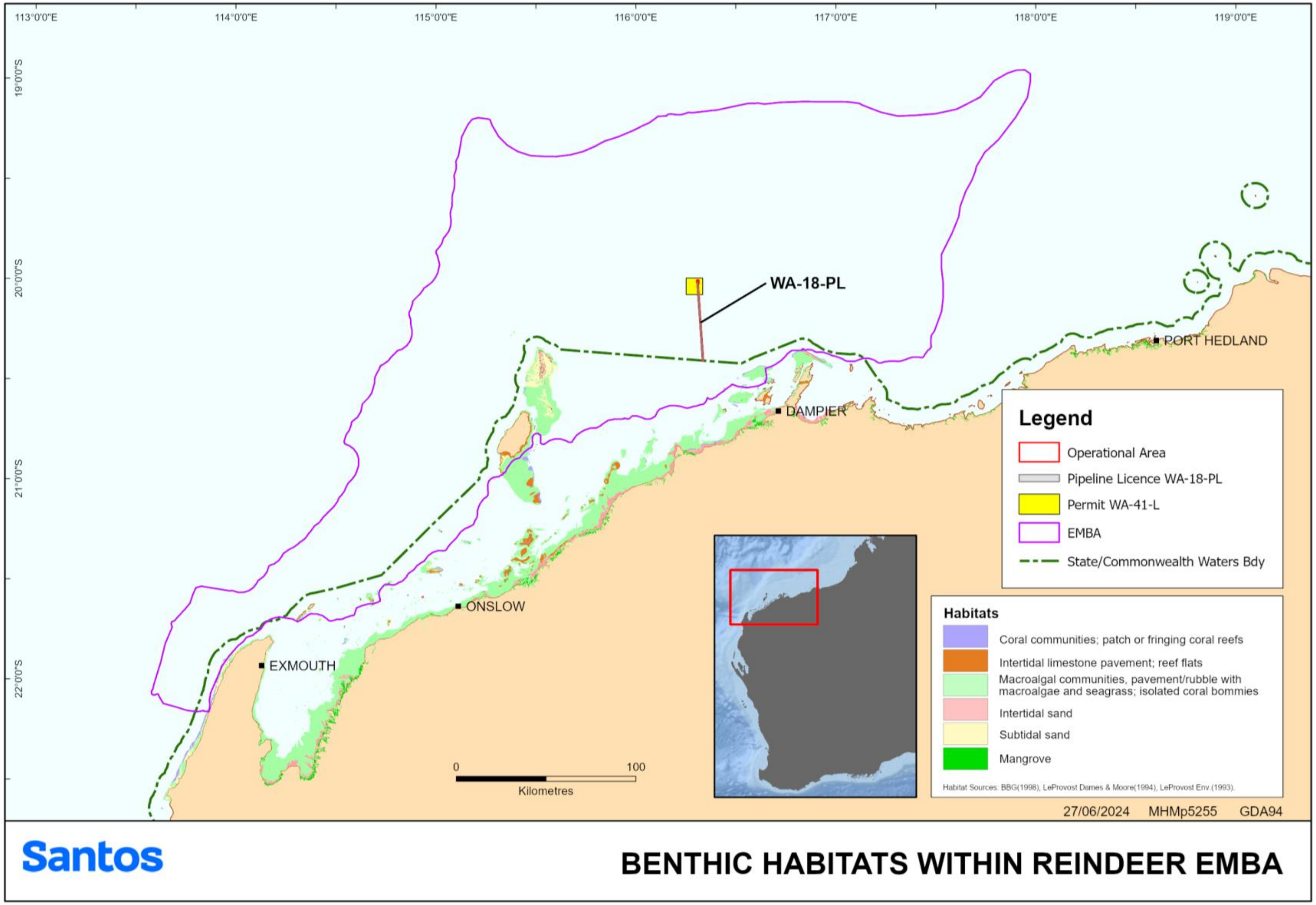

Figure 3-4: Benthic habitats within the Reindeer EMBA

Table 3-4: Habitats associated with receptors within the EMBA

Category	Receptor	Operational Area presence	EMBA presence					Relevant events that may impact on the receptors
			Northwest Province	Northwest Shelf Province	Northwest Transition	Central Western Transition	Central Western Shelf Transition	
Benthic Habitats	Coral reefs	✗	✗	✓	✓	✗	✓	Unplanned • Surface release of condensate from the WHP • Subsea release of condensate from DC supply pipeline • Surface release of diesel
	Seagrass	✗	✗	✓	✓	✗	✓	
	Macroalgae	✗	✗	✓	✓	✗	✓	
	Non-coral benthic invertebrates	✓	✓	✓	✓	✓	✓	Planned • Seabed disturbance. • Planned operational discharges • Planned chemical and hydrocarbon discharges Unplanned • Surface release of condensate from the WHP • Subsea release of condensate from DC supply pipeline • Surface release of diesel • Release of solid objects
Shoreline Habitats	Mangroves	✗	✗	✓	✗	✗	✓	Unplanned • Surface release of condensate from the WHP • Subsea release of condensate from DC supply pipeline • Surface release of diesel
	Intertidal platforms	✗	✗	✓	✗	✗	✓	
	Sandy beaches	✗	✗	✓	✗	✗	✓	
	Rocky shorelines	✗	✗	✓	✗	✗	✓	

3.2.5 Protected and significant areas

3.2.5.1 Australian Marine Parks and State Marine Parks, Management Areas and Reserves

The operational area does not intercept any Australian Marine Parks (AMPs) or state marine parks, management areas or reserves. The closest AMP is the Montebello AMP and Dampier Australian Marine Park, which are located ~32 km and 53 km respectively from the nearest boundary of the operational area. The closest state marine park is the Montebello Islands Conservation Park, located ~68 km west of the operational area.

Protected or significant areas identified in the EMBA are detailed in Table 3-5 with further discussion in Appendix C. The EMBA overlaps the Montebello Australian Marine Park, the Montebello Islands Marine Park (State), the Barrow Island Marine Park (State) and some of the Gascoyne Australian Marine Park, Ningaloo Australian Marine Park, and Dampier Australian Marine Park.

Australian marine parks are recognised under the EPBC Act for protecting and maintaining biological diversity and contributing to a national representative network of marine protected areas. Management plans for Australian marine parks have been developed and came into force on 1 July 2018. Under these plans, Australian marine parks are allocated conservation objectives (International Union for Conservation of Nature (IUCN) Protected Area Category) based on the Australian IUCN reserve management principles in Schedule 8 of the EPBC Regulations 2000. The marine park management zones that are relevant to the AMPs and State marine parks within the EMBA are listed in Table 3-6. Section 3.2.7.7 includes additional details regarding cultural heritage and marine parks.

Oil and gas operations and associated oil spill response may be conducted in a Multiple Use Zone (IUCN VI) subject to the class approval and prescriptions within the North-West Marine Parks Network Management Plan (MPNMP) (Director of National Parks, 2018). The ‘Class Approval – Mining Operations and Green House Gas Activities’ for the North-West MPNMP, which is applicable to petroleum-related activities, came into effect on 1 July 2018. Prescriptions or conditions of the North-West MPNMP and Class Approval for the North-West MPNMP that are considered relevant to the scope of this EP are provided in Table 3-7.

3.2.5.2 Key Ecological Features

Key ecological features (KEFs) that are components of the marine ecosystem that are considered to be important for biodiversity or ecosystem function and integrity of the Commonwealth Marine Area, are also included in the DCCEEW EPBC Act Protected Matters Search Tool results (Appendix D). No KEFs intercept the operational area. The closest KEFs to the operational area are the Ancient Coastline at 125 m Depth Contour KEF (located 44.8 km north from the closest edge of the operational area) and Glomar Shoals KEF (44.3 km northeast).

The EMBA overlaps several KEFs (Table 3-5 and Figure 3-7), including the Ancient Coastline at 125 m Depth Contour, Glomar Shoals, the Continental Slope Demersal Fish Communities, Commonwealth waters adjacent to Ningaloo Reef, and Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula.

3.2.5.3 Heritage Areas

Australia’s heritage is managed by various levels of government and peak bodies that identify and list places for their heritage values. Significant heritage places are identified and grouped (by type) into lists that guide the protection and management of heritage values. No heritage areas are located within the operational area, but the Ningaloo Coast World Heritage Area, and National Heritage Listed Area Dampier Archipelago (including Burrup Peninsula) are located within the EMBA. These areas are shown in Figure 3-6 and is further discussed in Appendix C.

3.2.5.4 Wetlands of International or National Importance

Wetlands are a critical part of our natural environment. They protect our shores from wave action, reduce the impacts of floods, absorb pollutants, and improve water quality. They provide habitat for animals and plants, and many contain a wide diversity of life, supporting plants and animals that are found nowhere else.

There are no Wetlands of International Importance (Ramsar) that overlap the EMBA, the closest is Eighty Mile Beach, 382 km east to the closest point of the operational area.

Table 3-5: Key Values and sensitivities within the EMBA

Name	Status, Zone or IUCN Classification	Presence in Operational Area	Presence in MEVA	Presence in EMBA	Distance to Operational Area
North-West Marine Region					
Australian Marine Parks					
Montebello AMP	Multiple Use Zone (IUCN VI)	✗	✓	✓	32 km
Dampier AMP	Habitat Protection Zone (IUCN IV)	✗	✓	✓	54 km
	National Park Zone (IUCN II	✗	✓	✓	73 km
	Multiple Use Zone (IUCN VI)	✗	✓	✓	81 km
Ningaloo AMP	Recreational Use Zone (IUCN IV)	✗	✗	✓	261 km
Gascoyne AMP	Multiple Use Zone (IUCN VI)	✗	✗	✓	278 km
State Marine Parks, Management Areas and Reserves					
Montebello/Barrow Islands Marine Conservation Reserve	Sanctuary Zone	✗	✓	✓	68 km
Barrow Island Marine Management Area	Unzoned (with exception of Bandicoot Bay Conservation Area)	✗	✓	✓	99 km
Barrow Island Marine Park	Multiple Use Zone (IUCN VI)	✗	✗	✓	106 km
Muiron Island Marine Management Area	Sanctuary Zone Special Purpose Zone Recreation Zone General Use Zone	✗	✗	✓	238 km
Ningaloo Marine Park	National Park Zone (IUCN II) Sanctuary Zone Special Purpose Zone Recreation Zone General Use Zone	✗	✗	✓	258 km
World Heritage Area					
Ningaloo Coast World Heritage Area	-	✗	✗	✓	238 km
Commonwealth Heritage Places					
Commonwealth Waters if the Ningaloo Marine Park	-	✗	✗	✓	260 km

Name	Status, Zone or IUCN Classification	Presence in Operational Area	Presence in MEVA	Presence in EMBA	Distance to Operational Area
National Heritage Places					
Dampier Archipelago (including Burrup {Peninsula)	-	✗	✓	✓	24 km
The Ningaloo Coast Heritage Area	-	✗	✗	✓	238 km
Key Ecological Features					
Glomar Shoals	-	✗	✓	✓	43 km
Ancient Coastline at 125 m Depth Contour	-	✗	✓	✓	45 km
Continental Slope Demersal Fish Communities	-	✗	✗	✓	95 km
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	-	✗	✗	✓	213 km
Commonwealth water adjacent to Ningaloo Reef	-	✗	✗	✓	260 km

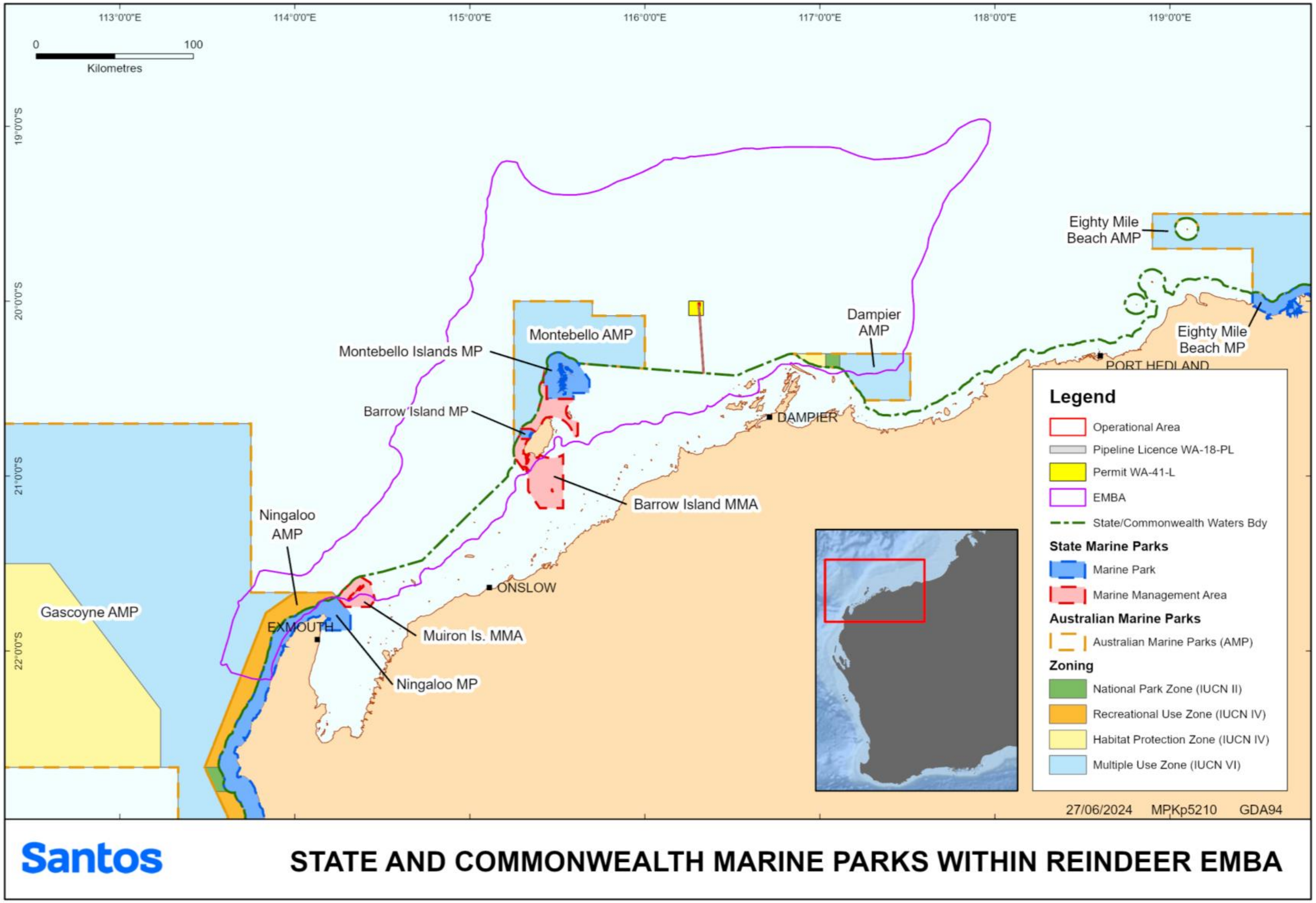

Figure 3-5: Marine Parks within the EMBA

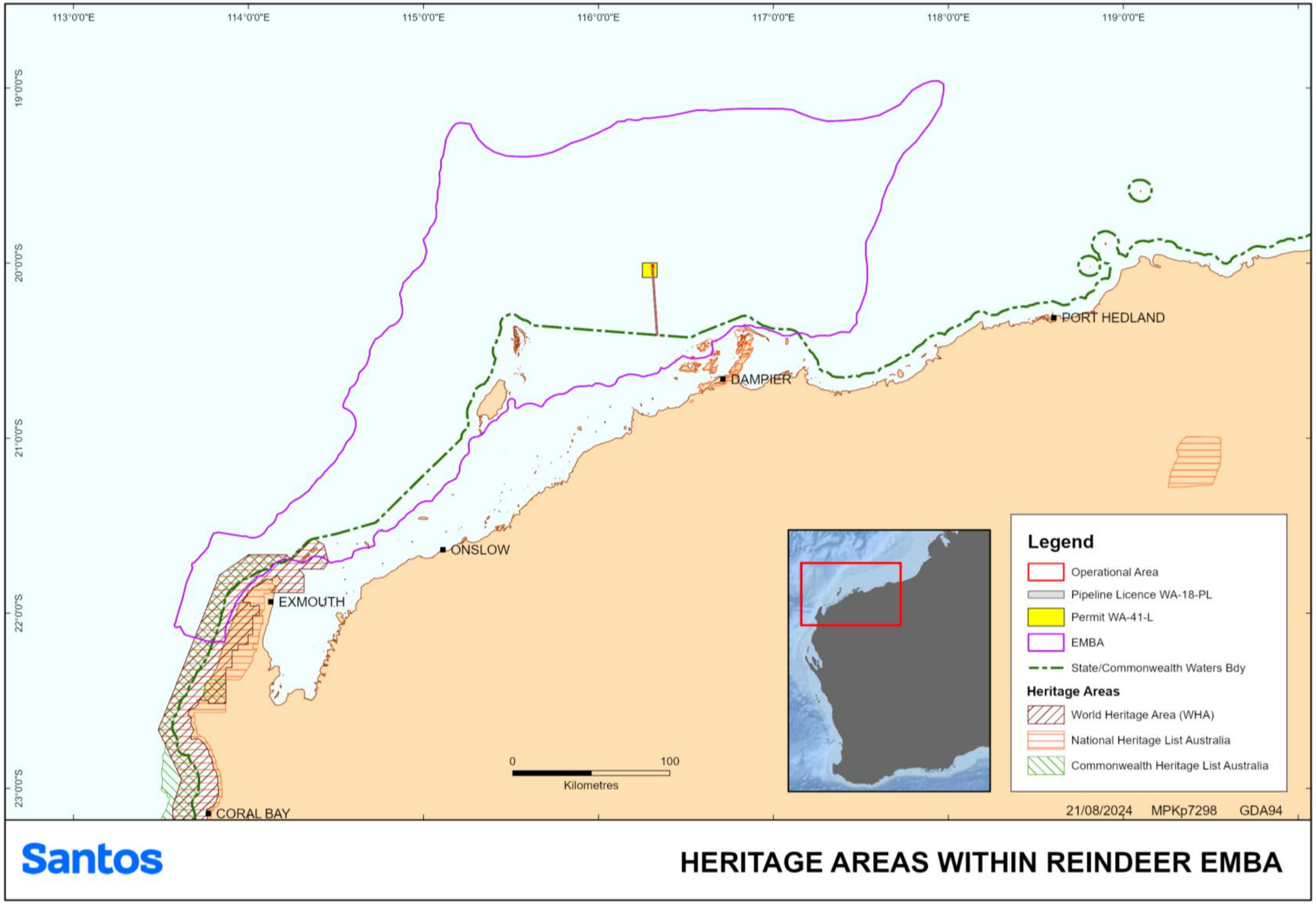

Figure 3-6: Heritage areas within the EMBA

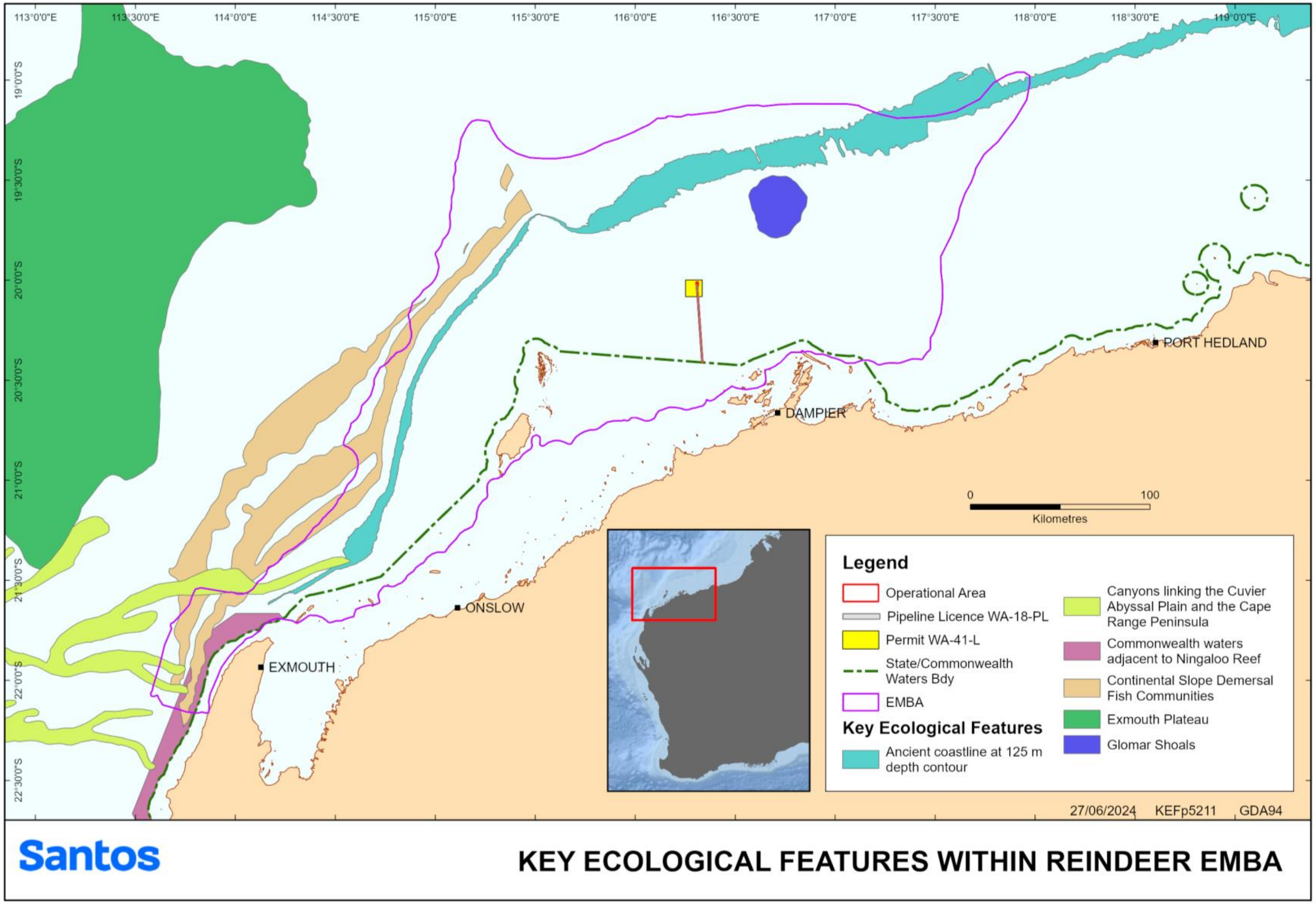

Figure 3-7: Key ecological features within the EMBA

Table 3-6: Management zones for the Australian Marine Parks found within the EMBA and the associated objectives

Management Zones	Objective
Australian Marine Parks	
Multiple Use (IUCN VI)	The objective is to provide for ecologically sustainable use and the conservation of ecosystems, habitats and native species. The zone allows a range of sustainable uses, including commercial fishing and mining where they are authorised and consistent with park values. Mining operations are defined in the EPBC Act and include oil spill response.
Recreational Use (IUCN IV)	The objective is to provide for the conservation of ecosystems, habitats and native species in as natural a state as possible, while providing for recreational use.
Habitat Protection Zone (IUCN IV)	The objective is to provide for the conservation of ecosystems, habitats and native species in as natural a state as possible, while allowing activities that do not harm or cause destruction to seafloor habitats.
National Park Zone (IUCN II)	The objective is to protect natural biodiversity with its underlying ecological structure and supporting environmental processes and to promote education and recreation.
Special Purpose Zone (IUCN VI)	The objective is to protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.
State Marine Parks	
Sanctuary Zones	The primary purpose of sanctuary zones is to protect and conserve marine biodiversity. Sanctuary zones are 'no-take' areas managed solely for nature conservation and low-impact recreation and tourism.
Special Purpose Zones	*Special purpose (benthic protection) zone*: This zone has the priority purpose of conservation of benthic habitat. *Special purpose (shore-based activities) zone*: Special purpose zones in marine parks are managed for a priority purpose or use, such as a seasonal event (e.g. wildlife breeding, whale watching) or a commercial activity (e.g. pearling).
Recreation Zones	Recreation zones have the primary purpose of providing opportunities for recreational activities, including fishing, for visitors and for commercial tourism operators, where these activities are compatible with the maintenance of the values of the zone.
General Use Zones	Conservation of natural values is still the priority of general use zones, but activities such as sustainable commercial and recreational fishing, aquaculture, pearling and petroleum exploration and production may be permitted, provided they do not compromise the ecological values of the marine park.

Table 3-7: Prescriptions/conditions from the North-West MPNMP 2018 and associated class approval – mining operations and greenhouse gas activities relevant to the activities in this EP

Prescription/ Condition No.	Prescription/Condition	Relevant Section of EP
North-west MPNMP (Director of National Parks, 2018)		
4.2.9.8	Notwithstanding Section 4.2.9.1 (of the North-West MPNMP), actions required to respond to oil pollution incidents, including environmental monitoring and remediation in connection with mining operations authorised under the OPGGS Act, may be conducted in all zones without an authorisation issued by the Director, provided that: • The actions are taken in accordance with an environment plan that has been accepted by NOPSEMA • The Director is notified in the event of oil pollution within a marine park or where an oil spill response action must be taken within a marine park, so far as reasonably practicable, prior to response action being taken.	This EP Section 4 (Stakeholder Consultation), reporting under Section 8 and the oil pollution emergency plan

Prescription/ Condition No.	Prescription/Condition	Relevant Section of EP
Class Approval – Mining Operations and Green House Gas Activities – for North-west MPNMP (Director of National Parks, 2018)		
1	Approved action must be conducted in accordance with: • An environment plan accepted under the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations (2023);	OPEP (some proposed response activities in the event of an oil pollution incident may be undertaken within the North-West Marine Park Network)
	• The EPBC Act;	Appendix B (Legislation)
	• The EPBC Regulations;	Throughout whole EP
	• The North-West MPNMP;	Table 3-7 (this table)
	• Any prohibitions, restrictions or determinations made under the EPBC Regulations by the Director of National Parks; and	Not applicable
	• All other applicable Commonwealth and State and Territory laws (to the extent those laws are capable of operating concurrently with the laws and instruments described in the preceding paragraphs).	Appendix B (Legislation), and the OPEP
2	If requested by the Director of National Parks, an Approved Person must notify the Director prior to conducting Approved Actions within Approved Zones. Note: the timeframe for prior notice will be agreed to by the Director of National Parks and the Approved Person.	Section 8.9 and 8.10 (Reporting) and the OPEP
3	If requested by the Director of National Parks, an Approved Person must provide the Director with information relating to undertaking the Approved Actions (or gathered while undertaking the Approved Actions) that is relevant to the Director's management of the Approved Zones. Note: the information required and timeframe within which it is required will be agreed to by the Director of National Parks and the Approved Person.	Not applicable

3.2.6 Threatened and Migratory Fauna

Table 3-8 presents the threatened and migratory species within the operational area and the EMBA. These include all relevant matters of national environmental significance (MNES) protected under the EPBC Act as identified in the PMST report for the operational area and the EMBA. For each species identified, their status under the Western Australia Biodiversity Conservation Act 2016 (BC Act 2016) is also provided as well as the extent of likely presence, including any overlap with designated biologically important areas (BIAs).

The PMST report identified 25 marine fauna species listed as 'threatened' and 40 marine fauna species listed as 'migratory' within the operational area, and 39 marine fauna species listed as 'threatened' (24 of those listed as migratory as well) and 34 additional marine fauna species listed as 'migratory' within the EMBA (Table 3-8). Other listed marine species that may occur within the operational area and the EMBA are provided in Appendix C. Note that terrestrial species that occur in the EPBC searches of the EMBA have been excluded where not relevant with respect to hydrocarbon concentrations of floating oil, entrained oil and dissolved aromatic hydrocarbons, and shoreline accumulations used to define the EMBA. Species that may occur on shorelines include shorebirds. Terrestrial mammals, reptiles (such as pythons) and bird species that do not have habitats along shorelines are excluded from Table 3-8. It should also be noted that seabirds and shorebirds are classified as marine fauna for the purposes of impact assessment within this EP.

Table 3-8: Protected species and communities within the operational area and the EMBA

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	**Scientific Name**									
Protected Species and Communities: Fish and Sharks										
Whale shark	*Rhincodon typus*	V, M	M	✓	Foraging, feeding or related behaviour known to occur within area Overlap with foraging BIA	✓	Foraging, feeding or related behaviour known to occur within area Overlap with foraging and foraging (high-density prey) BIA	✓	Foraging, feeding or related behaviour known to occur within area	Planned Light emissions Noise emissions Operational discharges Chemical and residual hydrocarbon discharges Spill response operations Unplanned Hydrocarbon releases Non-hydrocarbon releases Marine fauna interaction Introduction of invasive marine species
Grey nurse shark (west coast population)	*Carcharias taurus* (west coast population)	V	V	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Great white shark	*Carcharodon carcharias*	V, M	V	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat may occur within area	
Dwarf sawfish	*Pristis clavata*	V, M	M	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Green sawfish	*Pristis zijsron*	V, M	V	✓	Species or species habitat	✓	Species or species habitat known to occur within area	✓	Species or species habitat	

[1] *Note: CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory; CD = Conservation Dependent*

[2] *The Wildlife Conservation (Specially Protected Fauna) Notice 2018 has been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of threatened, extinct and specially protected species under Part 2 of the BC Act.*

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
					known to occur within area				known to occur within area	
Narrow sawfish	*Anoxypristis cuspidata*	M	M	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat likely to occur within area	
Freshwater sawfish	*Pristis pristis*	V	M	✓	Species or species habitat may occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Shortfin mako	*Isurus oxyrinchus*	M	M	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Longfin mako	*Isurus paucus*	M	M	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Reef manta ray	*Manta alfredi*	M	M	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Giant manta ray	*Manta birostris*	M	M	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat likely to occur within area	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
Blind gudgeon	*Milyeringa veritas*	V	V	x	N/A	✓	Species or species habitat known to occur within area	✓	Species or species habitat may occur within area	
Southern bluefin tuna	*Thunnus maccoyii*	CD	N/A	✓	Species or species habitat likely to occur within area	✓	Breeding known to occur within area	✓	Breeding known to occur within area	
Scalloped hammerhead	*Sphyrna lewini*	CD	N/A	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Oceanic whitetip shark	*Carcharhinus longimanus*	M	N/A	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Protected Species and Communities: Marine Mammals										
Humpback whale	*Megaptera novaeangliae*	M	Special conservation interest, M	✓	Species or species habitat known to occur within area Overlap with BIA for migration Breeding known to occur within area	✓	Congregation or aggregation known to occur within area Overlap with BIA for migration Migration (north and south) known to occur Breeding known to occur within area	✓	Breeding known to occur within area Migration (north and south) known to occur	Planned Noise emissions Operational discharges Chemical and residual hydrocarbon discharges Spill response operations

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
					Migration (north and south) known to occur.					Unplanned Hydrocarbon releases Non-hydrocarbon releases Marine fauna interaction
Blue whale	*Balaenoptera musculus*	E, M	E	✓	Species or species habitat likely to occur within area	✓	Migration route known to occur within area Overlap with BIA for migration	✓	Migration route known to occur within area	
Sei whale	*Balaenoptera borealis*	V, M	E	✓	Species or species habitat may occur within area	✓	Foraging, feeding or related behaviour likely to occur within area	✓	Species or species habitat likely to occur within area	
Fin whale	*Balaenoptera physalus*	V, M	E	✓	Species or species habitat may occur within area	✓	Foraging, feeding or related behaviour likely to occur within area	✓	Species or species habitat likely to occur within area	
Bryde's whale	*Balaenoptera edeni*	M	M	✓	Species or species habitat may occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Orca, killer whale	*Orcinus orca*	M	M	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Australian snubfin dolphin	*Orcaella heinsohni*	M	M	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within the area Overlaps with breeding, foraging, calving BIA	✓	Species or species habitat likely to occur within area	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
Spotted bottlenose dolphin	*Tursiops aduncus* (Arafura/Timor Sea populations)	M	M	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area Overlap with foraging likely, breeding, migration and calving BIA	✓	Species or species habitat known to occur within area	
Sperm whale	*Physeter macrocephalus*	M	V	**X**	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Australian humpback dolphin	*Sousa sahulensis*	M	M	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area Overlap with breeding, calving and foraging BIA	✓	<u>Species or species habitat known to occur within area</u>	
Dugong	*Dugong dugon*	M	M	✓	Species or species habitat known to occur within area	✓	Breeding, known to occur within area Overlap with calving, nursing, and foraging (high density seagrass beds) BIA	✓	Species or species habitat known to occur within area	
Southern right whale	*Eubalaena australis*	E,	V	X	N/A	✓	Species or species habitat likely to occur within area	✓	Species or species habitat may occur within area	
Antarctic minke whale	Balaenoptera bonaerensis	M	M	X	N/A	✓	Species or species habitat likely to occur within area	X	N/A	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
Protected Species and Communities: Marine Reptiles										
Leaf scaled sea snake	*Aipysurus foliosquama*	CE	CE	**X**	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	✓	<u>Species or species habitat known to occur within area</u>	<u>Planned</u> Light emissions Noise emissions Operational discharges Chemical and residual hydrocarbon discharges Spill response operations <u>Unplanned</u> Hydrocarbon releases Non-hydrocarbon releases Marine fauna interaction
Short-nosed seasnake	*Aipysurus apraefrontalis*	CE	CE	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Loggerhead turtle	*Caretta caretta*	E, M	E	✓	Species or species habitat known to occur within area Congregation or aggregation known to occur within area	✓	Breeding known to occur within area Overlap nesting and internesting buffer BIA	✓	Breeding known to occur within area Overlap with Internesting buffer and nesting BIA	
Green turtle	*Chelonia mydas*	V, M	V	✓	Species or species habitat known to occur within area Congregation or aggregation known to	✓	Breeding known to occur within area Overlap aggregation, basking, foraging, internesting/internesting buffer, mating migration corridor, and nesting BIA	✓	Breeding known to occur within area Overlaps nesting, basking, foraging, interesting buffer, internesting,	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
					occur within area				and mating BIA	
Leatherback turtle	*Dermochelys coriacea*	E, M	V	✓	Species or species habitat likely to occur within area	✓	Species or species habitat known to occur within area	✓	Breeding likely to occur within area	
Hawksbill turtle	*Eretmochelys imbricata*	V, M	V	✓	Species or species habitat known to occur within area Congregation or aggregation known to occur within area	✓	Breeding known to occur within area Overlap with breeding, nesting, foraging, internesting/internesting buffer, migration corridor, and mating BIA	✓	Breeding known to occur within area Overlaps nesting, foraging, internesting, internesting buffer, and mating known to occur	
Flatback turtle	*Natator depressus*	V, M	V	✓	Congregation or aggregation known to occur within area Overlap with internesting buffer BIA Congregation or aggregation known to occur within area	✓	Breeding known to occur within area, Overlap with aggregation, foraging, internesting/internesting buffer, mating, migration corridor, and nesting BIA	✓	Breeding known to occur within area Overlaps foraging, internesting buffer, mating and nesting BIA	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
Protected Species and Communities: Marine Birds										
Red-tailed tropicbird (Indian Ocean)	*Phaethon rubricauda westralis*	E	N/A	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	Planned Light emissions Noise emissions Operational discharges Chemical and residual hydrocarbon discharges Atmospheric emissions Spill response operations Unplanned Hydrocarbon releases Non-hydrocarbon releases Marine fauna interaction
White tailed tropicbird	*Phaethon lepturus*	M	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat likely to occur within area	
Christmas Island White tailed tropicbird	*Phaethon lepturus fulvus*	E	N/A	X	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Curlew sandpiper	*Calidris ferruginea*	CE, M	CE	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	✓	Species or species habitat known to occur within area Species or species habitat known to occur within area overfly marine area	✓	Species or species habitat known to occur within area Species or species habitat known to occur within area overfly marine area	
Red knot	*Calidris canutus*	V, M	E	✓	Species or species habitat may occur within area Species or species	✓	Species or species habitat known to occur within area Species or species habitat known to occur within area overfly marine area	✓	Species or species habitat known to occur within area	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	**Scientific Name**									
					habitat may occur within area overfly marine area				Species or species habitat known to occur within area overfly marine area	
Greater sand plover	*Charadrius leschenaultii*	V, M	V	X	N/A	✓	Species or species habitat known to occur within area	✓	Species or species habitat likely to occur within area	
Southern giant petrel	*Macronectes giganteus*	E, M	Specially protected, M	✓	Species or species habitat may to occur within area	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Eastern curlew	*Numenius madagascariensis*	CE, M	CE	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Common noddy	*Anous stolidus*	M	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Streaked shearwater	*Calonectris leucomelas*	M	N/A	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	✓	Species or species habitat likely to occur within area	
Lesser frigatebird	*Fregata ariel*	M	N/A	✓	Species or species habitat likely	✓	Species or species habitat known occur within area	✓	Species or species habitat	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
					to occur within area				known to occur within area	
Common sandpiper	*Actitis hypoleucos*	M	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Sharp-tailed sandpiper	*Calidris acuminata*	V, M	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Pectoral sandpiper	*Calidris melanotos*	M	N/A	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	
Osprey	*Pandion haliaetus*	M	N/A	**X**	N/A	✓	Breeding known to occur within area	✓	Breeding known to occur within area	
Greater crested tern	*Thalasseus bergii*	M	N/A	**X**	N/A	✓	Breeding known to occur within area	✓	Breeding known to occur within area	
Lesser crested tern	*Thalasseus bengalensis*	M	N/A	**X**	N/A	✓	Not listed in PMST search; however,	✓	Not listed in PMST	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
							breeding BIA does overlap the EMBA and therefore this species is assumed to be within the EMBA		search; however, breeding BIA does overlap the MEVA and therefore this species is assumed to be within the MEVA	
Bar-tailed godwit	*Limosa lapponica*	V, M	N/A	**X**	N/A	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Northern Siberian bar-tailed godwit	*Limosa lapponica menzbieri*	E, M	CE, specially protected, M	**X**	N/A	✓	Species or species habitat known to occur within area	✓	Species or species habitat known to occur within area	
Australian fairy tern	*Sternula nereis nereis*	V	V	✓	Breeding known to occur within area	✓	Breeding known to occur within area Overlap with breeding BIA(listed as *Sternula nereis*)	✓	Breeding known to occur within area Overlap with breeding BIA (listed as *Sternula nereis*)	
Fork-tailed swift	*Apus pacificus*	M	N/A	**X**	N/A	✓	Species or species habitat likely to occur within area Species or species habitat likely to occur	✓	Species or species habitat likely to occur within area	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
							within area overfly marine area		Species or species habitat likely to occur within area overfly marine area	
Wedge-tailed shearwater	*Ardenna pacifica*	M	N/A	X	N/A	✓	Breeding known to occur within area Overlap with breeding BIA	✓	Breeding known to occur within area Overlap with breeding BIA	
Greater frigatebird	*Fregata minor*	M	N/A	X	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Caspian tern	*Hydroprogne caspia*	M	N/A	X	N/A	✓	Breeding known to occur within area	✓	Breeding known to occur within area	
Bridled tern	*Onychoprion anaethetus*	M	N/A	X	N/A	✓	Breeding known to occur within area	✓	Breeding known to occur within area	
Roseate tern	*Sterna dougallii*	M	N/A	✓	Foraging, feeding or related behaviour likely to occur within area Breeding likely to	✓	Breeding known to occur within area Overlap with breeding BIA	✓	Breeding known to occur within area Overlap with breeding BIA	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	**Scientific Name**									
					occur within area					
Little tern	*Sternula albifrons*	M	N/A	**X**	N/A	✓	Species or species habitat may occur within area Overlap with breeding and resting BIA	✓	Species or species habitat may occur within area	
Oriental plover	*Charadrius veredus*	M	N/A	**X**	N/A	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	
Oriental pratincole	*Glareola maldivarum*	M	N/A	**X**	N/A	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species habitat may occur within area overfly marine area	
Asian dowitcher	*Limnodromus semipalmatus*	V, M	N/A	**X**	N/A	✓	Species or species habitat known to occur within area Species or species habitat known to occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
									habitat may occur within area overfly marine area	
Common greenshank	*Tringa nebularia*	E, M	N/A	**X**	N/A	✓	Species or species habitat likely to occur within area Species or species habitat likely to occur within area overfly marine area	✓	Species or species habitat likely to occur within area Species or species habitat likely to occur within area overfly marine area	
White-winged fairy-wren (Barrow Island), Barrow Island black-and-white fairy-wren	*Malurus leucopterus edouardi*	V	N/A	**X**	N/A	✓	Species or species habitat likely to occur within area	X		
Soft-plumaged petrel	*Pterodroma mollis*	V	N/A	**X**	N/A	✓	Species or species habitat may occur within area	X		
Campbell albatross	*Thalassarche impavida*	V, M	V	**X**	N/A	✓	Species or species habitat may occur within area	X		
Flesh-footed shearwater	*Ardenna carneipes*	M	N/A	**X**	N/A	✓	Species or species habitat likely to occur within area	X		
Australian painted snipe	*Rostratula australis*	E	E	**X**	N/A	✓	Species or species habitat likely to occur within area Species or species habitat likely to occur within area overfly marine area	✓	Species or species habitat may occur within area Species or species	

Value/Sensitivity		EPBC Act Status[1]	BC Act 2016[2]	Operational Area Presence	Particular Values or Sensitivities within Operational Area	EMBA Presence	Particular Values or Sensitivities Within EMBA	MEVA Presence	Particular Values or Sensitivities Within MEVA	Relevant Events
Common Name	Scientific Name									
									habitat may occur within area overfly marine area	
Indian yellow-nosed albatross	*Thalassarche carteri*	V, M	E	**X**	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	
Red Goshawk	*Erythrotriorchis radiatus*	E	N/A	**X**	N/A	✓	Species or species habitat may occur within area	✓	Species or species habitat may occur within area	

Source: EPBC Act Protected Matters Search Tool (2024)

3.2.6.1 Biologically Important Areas and Critical Habitat

BIAs are areas that have been identified where threated or migratory species protected under the EPBC Act carry out critical lifecycle activities. In addition to BIAs, habitat critical for the survival of the species has also been identified for marine turtles and these are areas in addition to BIAs where marine turtles carry out critical lifecycle activities.

BIAs such as an aggregation, breeding, resting, nesting or feeding area or known migratory route for areas deemed habitat critical for the survival of a species within the operational area and EMBA are shown in Table 3-9, Figure 3-8, Figure 3-9, and Figure 3-14 and are described further in Values and Sensitivities of the Western Australian Marine Environment (EA-00-RI-10062, Appendix C.

3.2.6.2 Habitat Critical to the survival of a Species

Habitat critical to the survival of species 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
- for the reintroduction of populations or recovery of the species.

The Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) identifies draft habitat critical to the survival of a species for marine turtles as:

- nesting habitat critical to the survival of green, loggerhead, flatback and hawksbill turtles includes at least 70% of nesting for the stock
- nesting habitat critical to the survival of olive ridley turtles includes all documented nesting areas in Queensland and Western Australia, and beaches where nesting has been recorded with greater than ten nesting females in the Northern Territory (noting inter-annual fluctuations)
- nesting habitat critical to the survival of leatherback turtles includes all areas where nesting has occurred in Australia since 1996
- nesting habitat critical to survival of marine turtles is of a geographically relevant scale.

For example, green turtles are known to move between islands of the Capricorn Bunker Group within a nesting season, while leatherback turtles may move up to 400 km within a season where relevant, nesting habitat determined to be critical to the survival of marine turtles includes areas that are: geographically dispersed; major and minor rookeries; mainland and island beaches; and winter or summer nesting to ensure the validity of long-term monitoring programs for assessing trends in nesting turtle abundance, all index beaches are considered habitat critical to survival of marine turtles internesting habitat critical to the survival of marine turtles is located immediately seaward of designated nesting habitat critical to the survival of marine turtles. The internesting habitat critical buffer for green, loggerhead, hawksbill, olive ridley and leatherback turtles is 20 km and 60 km for flatback turtles.

Habitat critical to the survival of marine turtles within the operational area and EMBA is described in Table 3-9 and Appendix C.

Table 3-9: BIAs in the operational area and the EMBA

Species	BIA area	Operational Area	Operational Area with 20 km light buffer[3]	Presences in MEVA	Presences in EMBA	Habitat Critical within EMBA[4]
Whale shark	Foraging	✓	✓	✓	✓	N/A
	Foraging (high density prey)	-	-	-	✓	
Pygmy blue whale	Foraging	-		-	✓	N/A
	Migration	-	-	-	✓	
	Distribution	✓	✓	✓	✓	
Humpback whale	Migration (north and south)	✓	✓	✓	✓	
Southern right whale	Migration	-	-	-	✓	
	Reproduction	-	-	-	✓	
Dugong	Breeding	-	-	-	✓	
	Calving	-	-	-	✓	
	Nursing	-	-	-	✓	
	Foraging (high density seagrass beds)	-	-	-	✓	
Green turtle	Congregation/aggregation	-	-	-	✓	Scott Reef – 20 km internesting buffer 20 km internesting buffer: Adele Island, Barrow Island, Lacepede Islands, Montebello Islands (all with sandy beaches), Dampier Archipelago, Serrurier Island, Thevenard Island, Northwest Cape, Ningaloo coast; Ashmore Reef and Cartier Reef
	Basking	-	-	✓	✓	
	Foraging	-	-	✓	✓	
	Internesting	-	-	✓	✓	
	Internesting buffer	-	✓	✓	✓	
	Mating	-	-	✓	✓	
	Migration corridor	-	-	-	✓	
	Nesting	-	-	✓	✓	

[3] 20km buffer for receptors that have potential interaction with light based on recommendations from the National Pollution Guidelines for Wildlife (DCCEEW,2023)

[4] Source: COA, 2017

Species	BIA area	Operational Area	Operational Area with 20 km light buffer[3]	Presences in MEVA	Presences in EMBA	Habitat Critical within EMBA[4]
	Critical Habitat	✓	✓	✓	✓	
Loggerhead turtle	Internesting buffer	-	✓	✓	✓	20 km internesting buffer: Muiron Islands, Ningaloo coast
	Nesting	-	-	✓	✓	
	Critical habitat	-	-	-	✓	
Hawksbill turtle	Congregation/aggregation	-	-	-	✓	20 km internesting buffer: 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
	Nesting	-	-	✓	✓	
	Internesting	-	-	✓	✓	
	Internesting buffer	-	✓	✓	✓	
	Foraging	-	-	✓	✓	
	Mating			✓	✓	
	Migration corridor	-	-	-	✓	
	Critical habitat	✓	✓	✓	✓	
Flatback turtle	Congregation/aggregation	-	-	-	✓	60 km internesting buffer: Eighty Mile Beach, Eco Beach, Lacepede Islands, Montebello Islands, Mundabullangana Beach, Barrow Island, Cemetery Beach, Dampier Archipelago (including Delambre Island and Hauy Island), coastal islands from Cape Preston to Locker Island
	Nesting	-	-	✓	✓	
	Internesting	-	-	-	✓	
	Internesting buffer	✓	✓	✓	✓	
	Foraging	-	-	✓	✓	
	Mating			✓	✓	
	Migration corridor	-	-	-	✓	
	Critical Habitat	✓	✓	✓	✓	
Fairy tern	Breeding	-	✓	✓	✓	N/A
Lesser crested tern	Breeding	-	-	✓	✓	N/A
Roseate tern	Breeding	✓	✓	✓	✓	N/A

Species	BIA area	Operational Area	Operational Area with 20 km light buffer[3]	Presences in		Habitat Critical within EMBA[4]
				MEVA	EMBA	
Wedge-tailed shearwater	Breeding	✓	✓	✓	✓	N/A

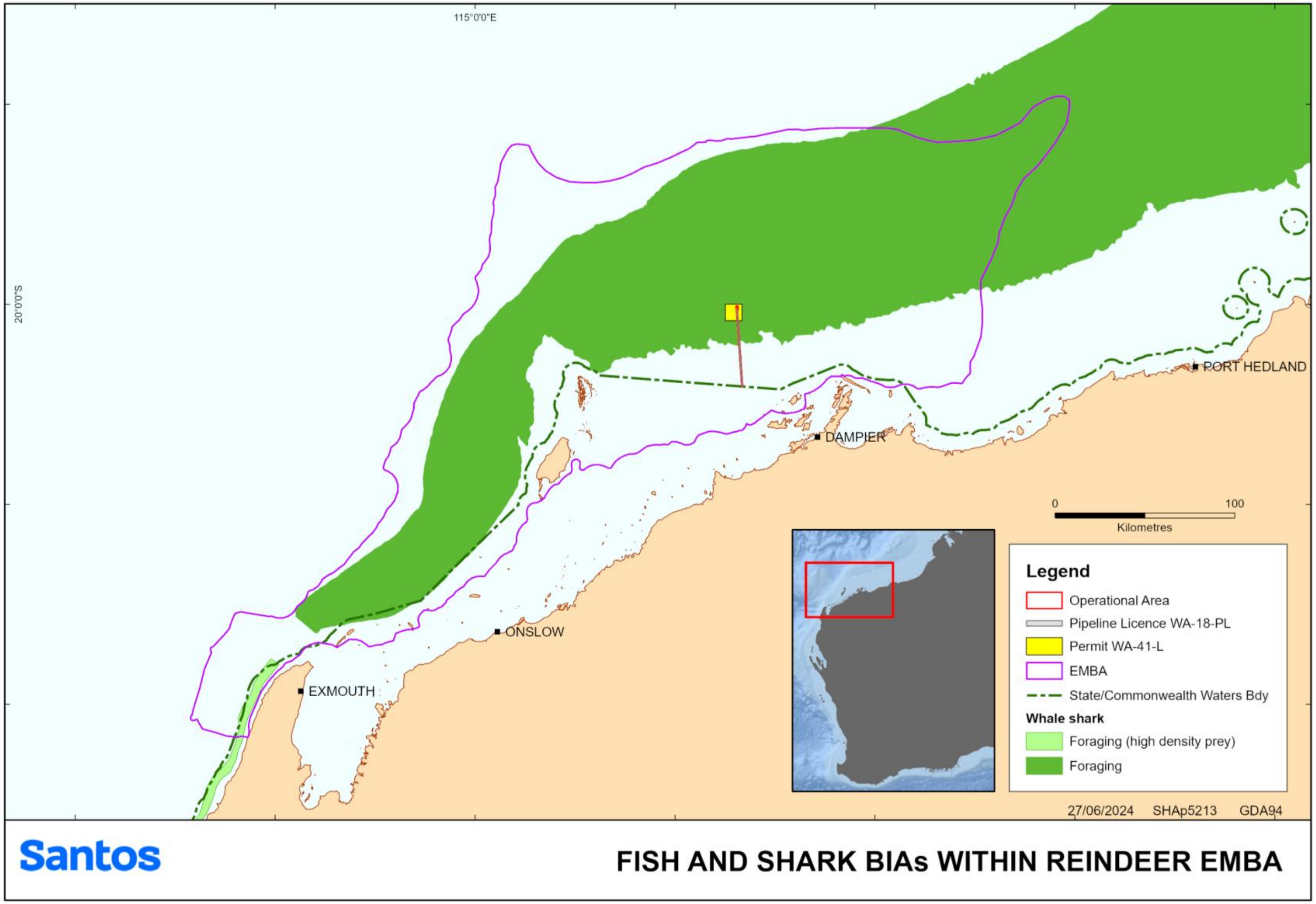

Figure 3-8: Fish and sharks BIA within the EMBA

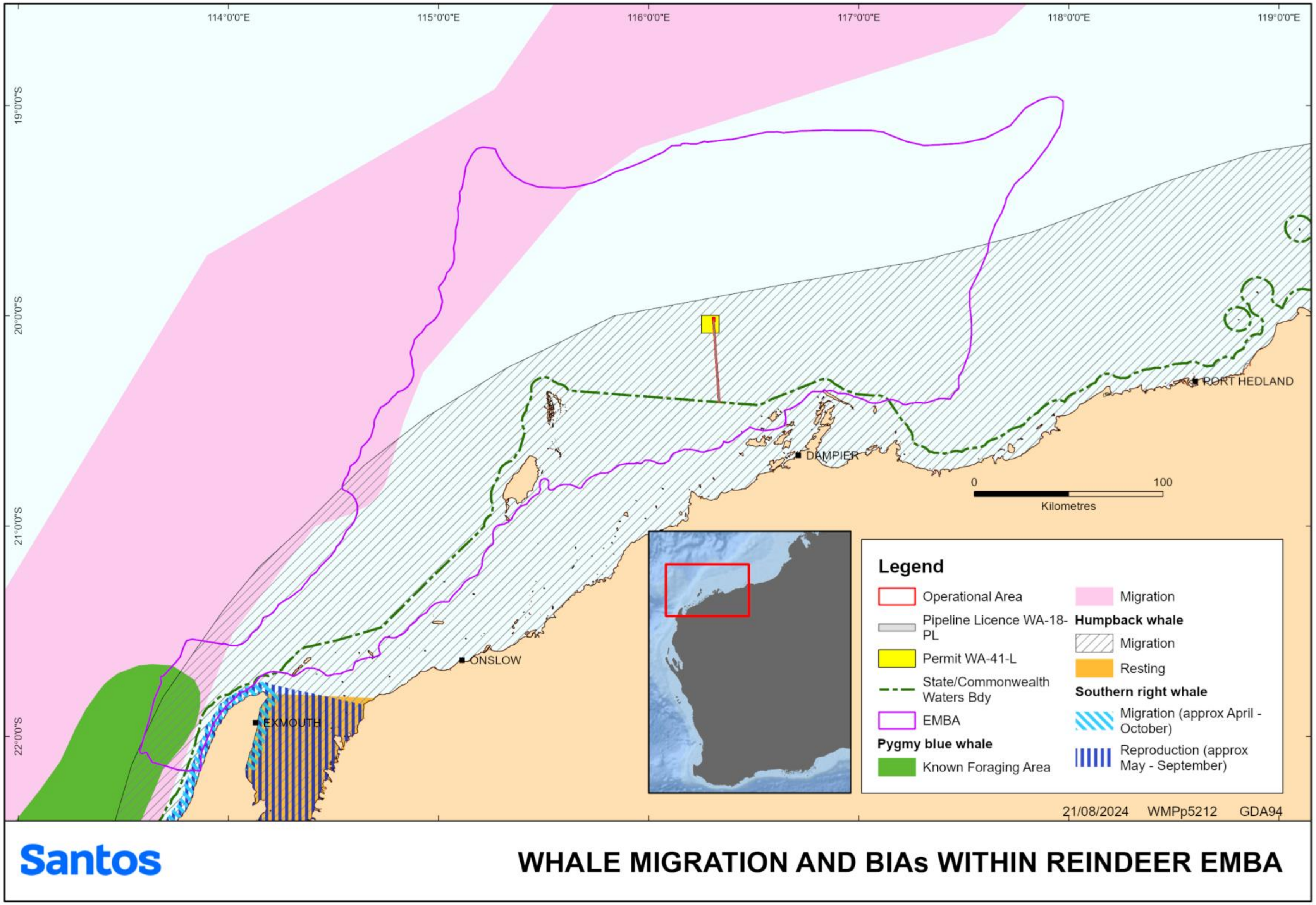

Figure 3-9: Whale migration and BIA within the EMBA

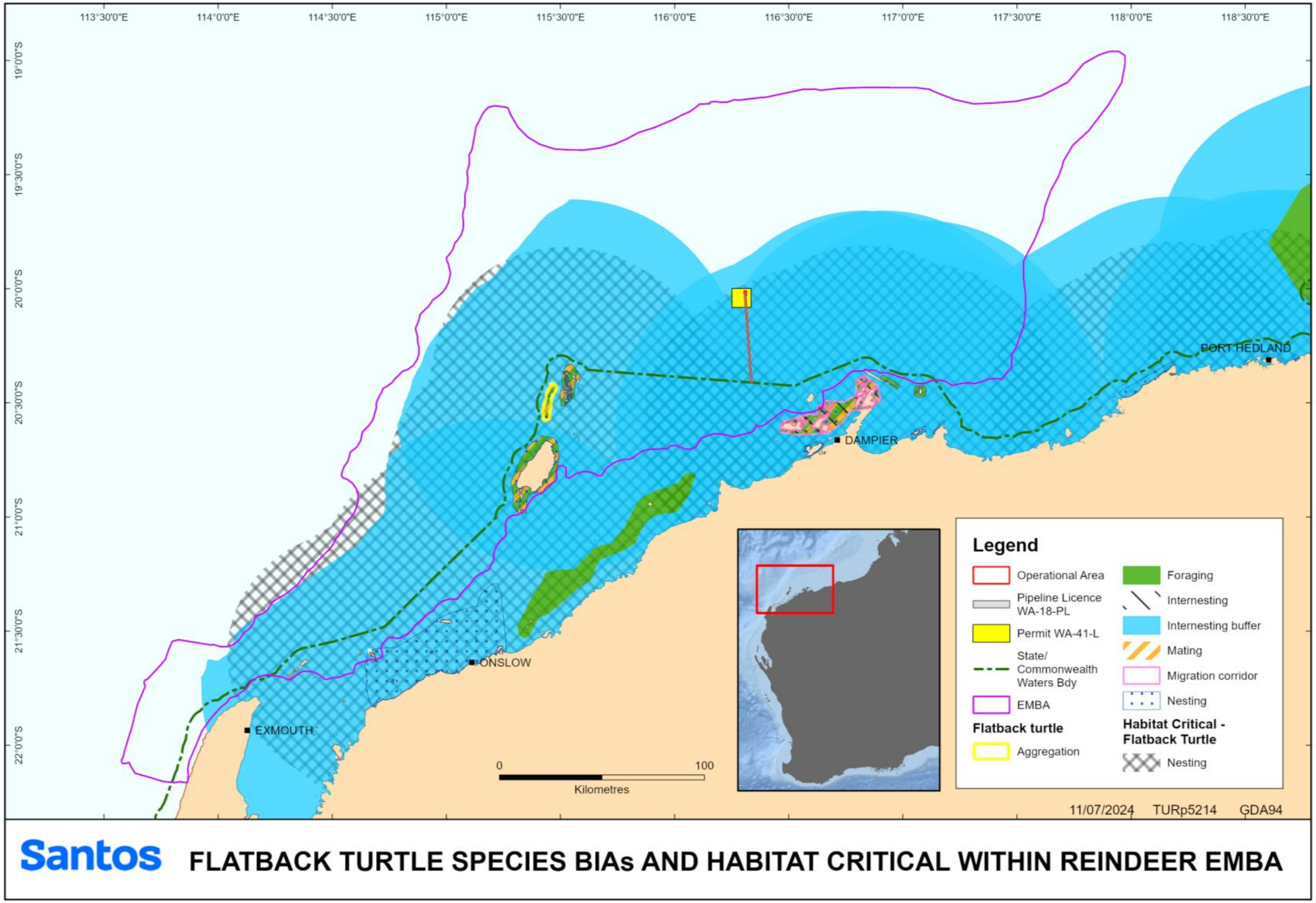

Figure 3-10: Flatback turtle BIAs within the EMBA

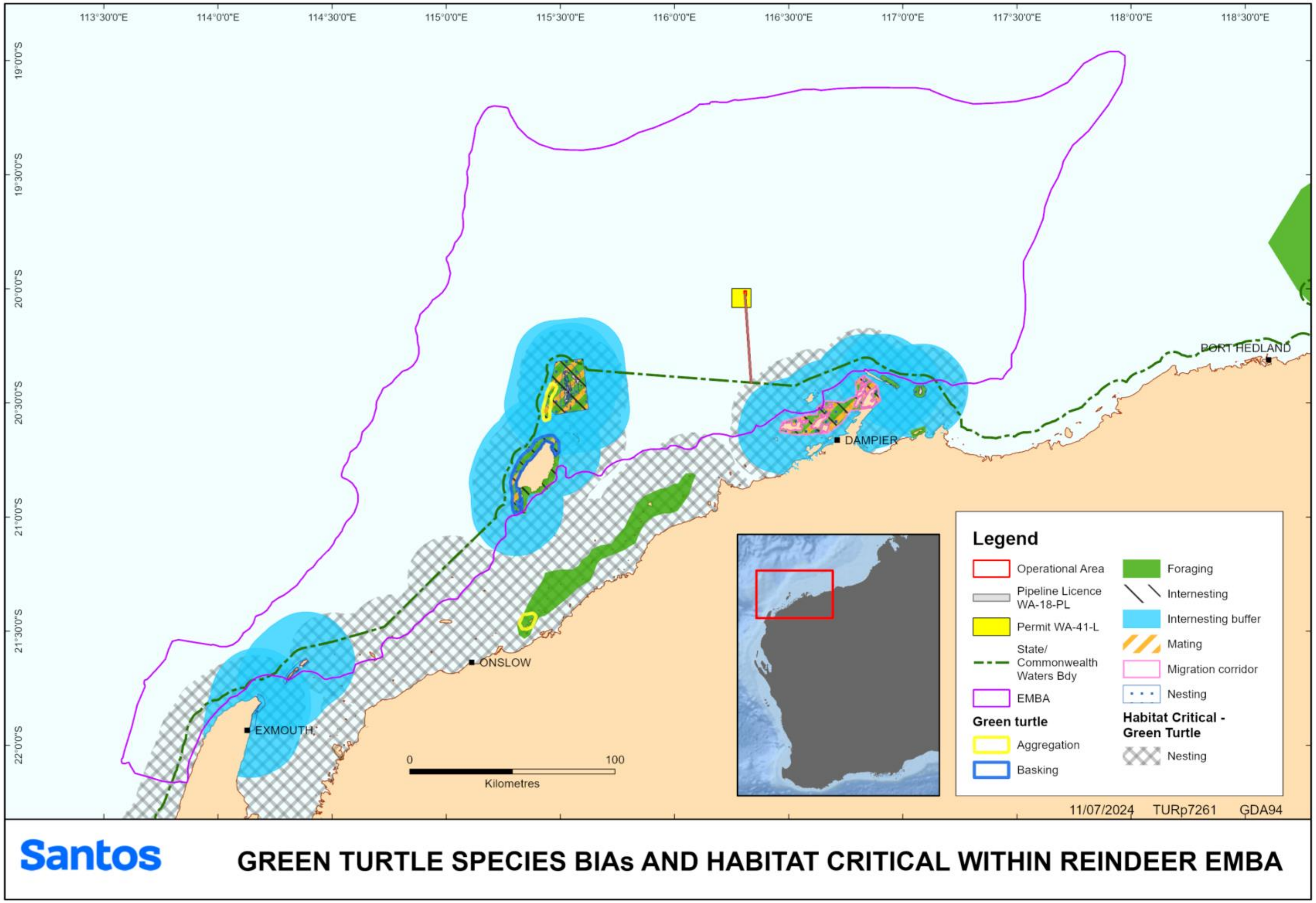

Figure 3-11: Green turtle BIAs within the EMBA

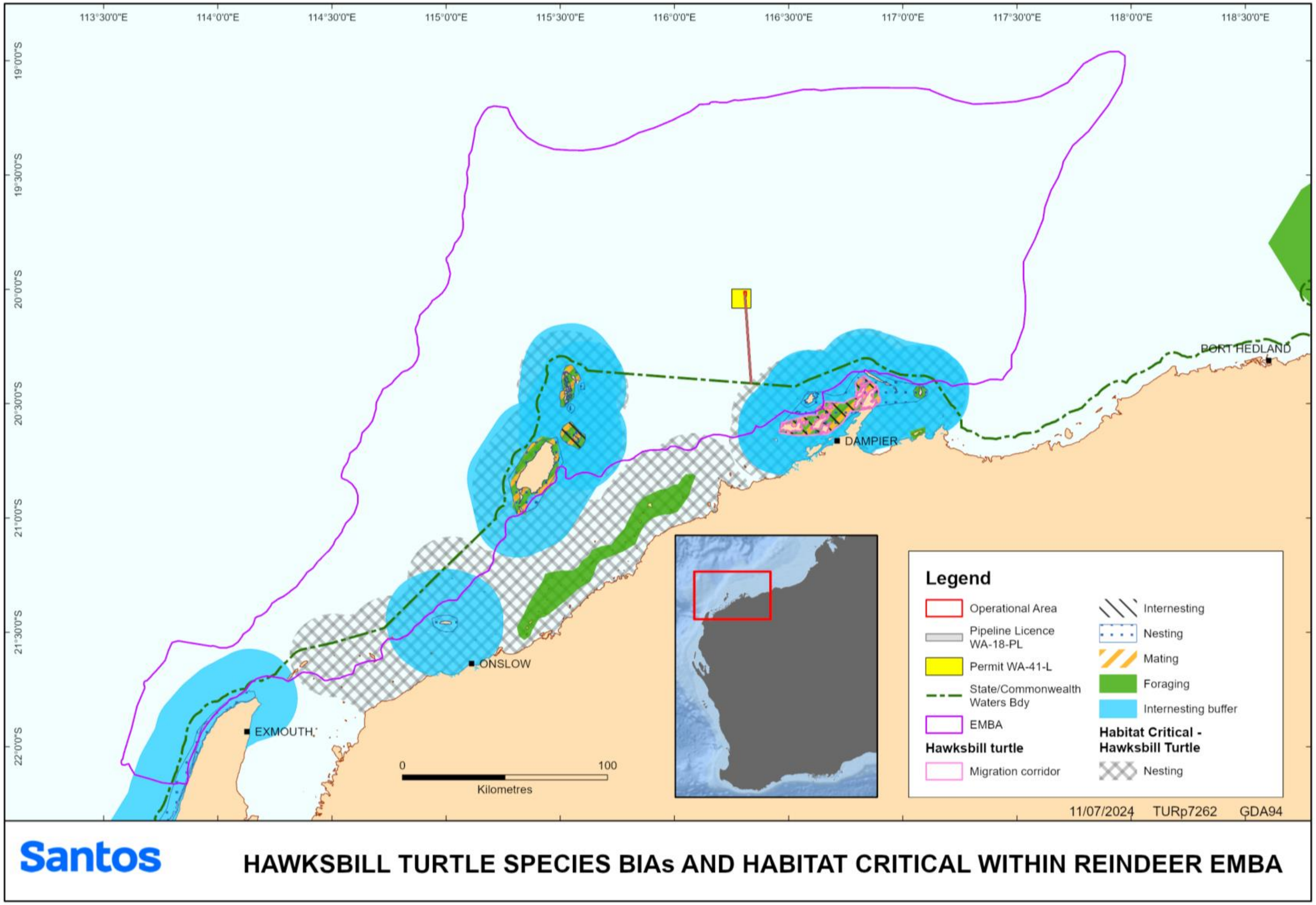

Figure 3-12: Hawksbill Turtle BIAs within the EMBA

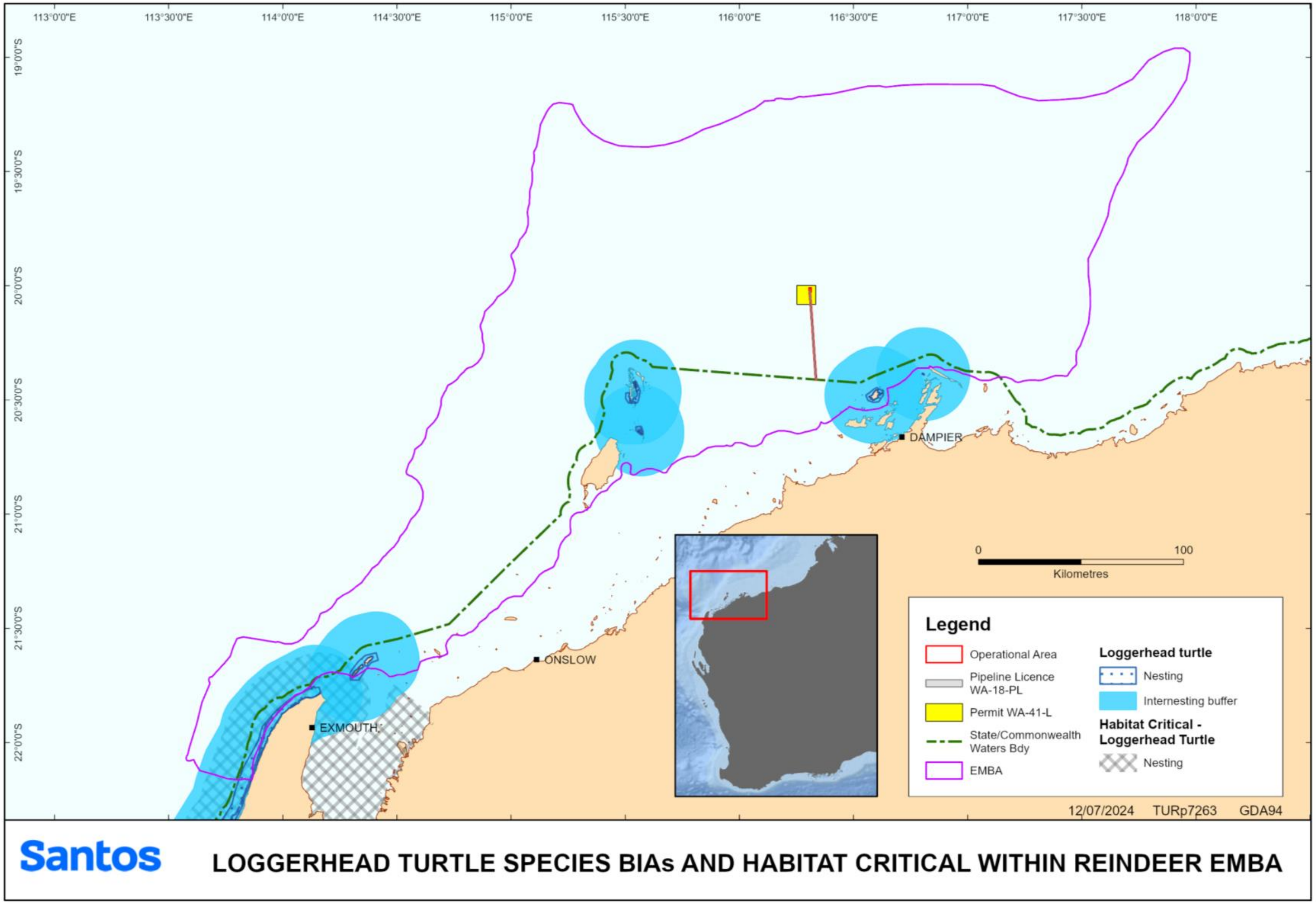

Figure 3-13: Loggerhead BIAs within the EMBA

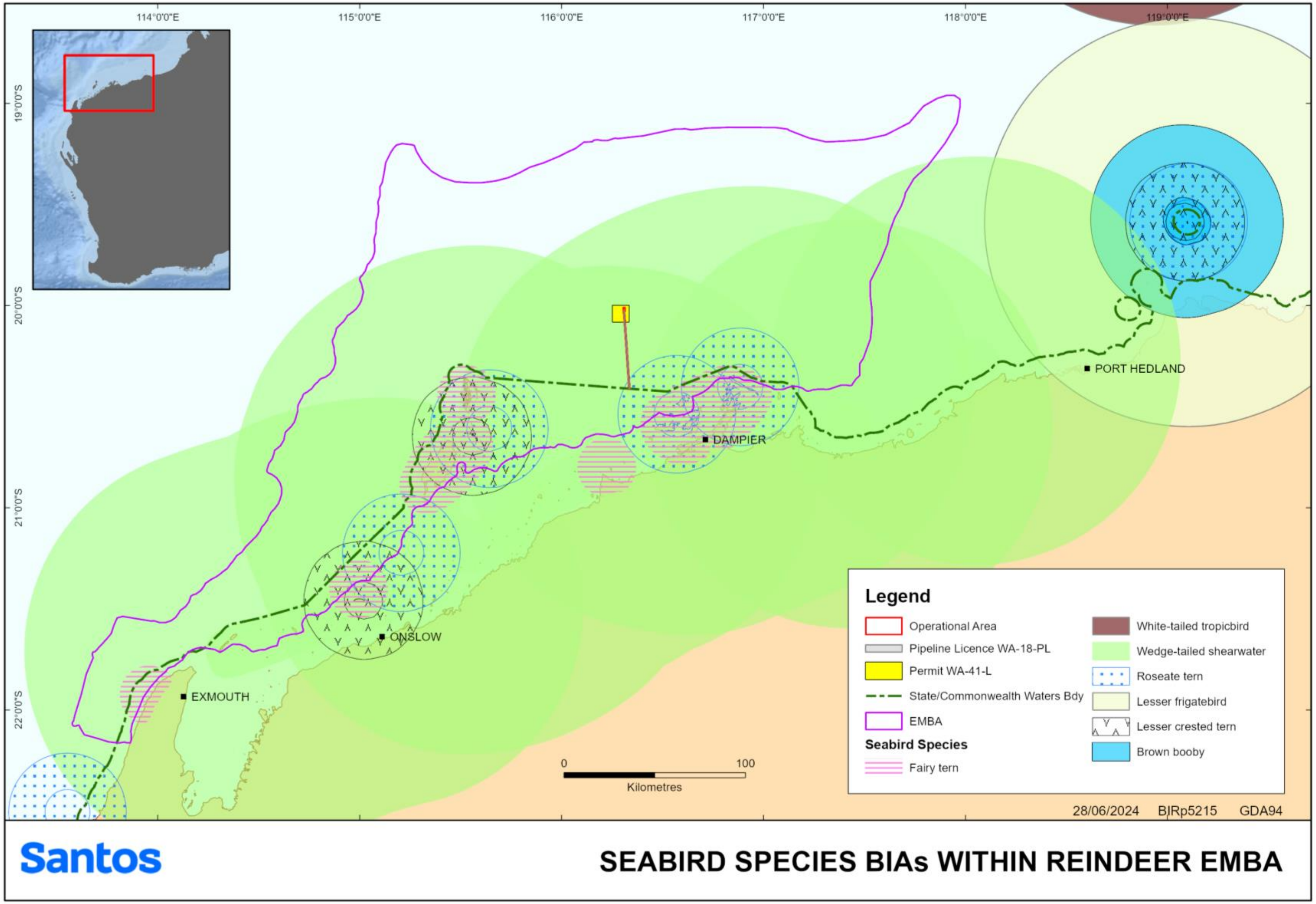

Figure 3-14: Seabird species BIA within the EMBA

3.2.6.3 Recovery plans

To support the protection of threatened and migratory species a series of recovery plans, conservation advice and species management plans have been developed by the Commonwealth of Australia. These documents identify threats to the specific species they are associated with and, in some cases, recommend conservation actions that should be undertaken to protect that species.

Table 3-10 recovery plans, conservation advice and species management plans relevant to the threatened and migratory species that have been identified as potentially occurring within the operational area, HEVA, MEVA and EMBA. Table 3-10 also identifies the actions within these documents that are relevant to the petroleum activity.

Table 3-10: Threats and strategies from recovery plans, conservation advice and management plans relevant to the activity

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
All Fauna				
All vertebrate fauna Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia,2018)	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate wildlife of Australia's coasts and oceans (Commonwealth of Australia,2018)	Marine debris	No explicit management actions for non-fisheries related industries (note that management actions in the plan relate largely to management of fishing waste (for example 'ghost' gear), and State and Commonwealth management through regulation.	7.3
Cetaceans				
Blue whale	Blue Whale Conservation Management Plan 2015–2025 (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference	Assess and address anthropogenic noise: shipping, industrial and seismic noise. Minimise vessel collisions: Develop a national vessel strike strategy that investigates the risk of vessel strike on blue whales and also identifies potential mitigation measures. Ensure all vessel strike incidents are reported in the National Ship Strike Database. Ensure the risk of vessel strikes on blue whales is considered when assessing actions that increase vessel traffic in areas where blue whales occur and, if required, appropriate mitigation measures are implemented.	6.1
		Habitat modification		7.2, 7.3
		Vessel disturbance		7.2
		Climate Variability and Change		6.3
		Marine Debris		7.3
Fin whale	Approved Conservation Advice for *Balaenoptera physalus* (fin whale) (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Anthropogenic noise and acoustic disturbance	Once the spatial and temporal distribution (including biologically important areas) of Fin Whales is further defined, assess the impacts of increasing anthropogenic noise (including seismic surveys, port expansion, and coastal development). Develop a national vessel strike strategy that investigates the risk of vessel strikes on Fin Whales and identifies potential mitigation measures. Ensure all vessel strike incidents are	6.1
		Climate and oceanographic variability and change		6.3
		Habitat degradation including pollution (persistent toxic pollutants)		6.3, 6.5.6, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Vessel strike		7.2

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
			reported in the National Vessel Strike Database. No explicit management measures for marine debris.	
Sei whale	Approved Conservation Advice for *Balaenoptera borealis* (sei whale) (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Anthropogenic noise and acoustic disturbance	Once the spatial and temporal distribution (including biologically important areas) of Sei Whales is further defined, assess the impacts of increasing anthropogenic noise (including seismic surveys, port expansion, and coastal development).	6.1
		Climate and oceanographic variability and change		6.3
		Habitat degradation including pollution (persistent toxic pollutants)		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Marine debris		7.3
		Vessel strike		7.2
Southern right whale	Conservation Management Plan for the Southern Right Whale 2011-2021 (2012)	Habitat modification	No explicit relevant management actions: entanglement in marine debris identified as a threat. Assess and address anthropogenic noise: shipping, industrial and seismic noise. Develop a national ship strike strategy that quantifies vessel movements within the distribution ranges of southern right whales and outlines appropriate mitigation measures that reduce impacts from vessel collisions.	7.2, 7.3
		Climate variability and change		6.3
		Vessel disturbance		7.2
		Noise interference		6.1
	National Recovery Plan for Southern Right Whale (2024)	Anthropogenic climate change and climate variability	Understand impacts of climate variability and anthropogenic climate change on species biology and population recovery.	6.3
		Anthropogenic underwater noise	Assess manage and mitigate impacts from anthropogenic underwater noise	6.1
		Collision/vessel strike	Manage, minimise and mitigate threat of vessel strike	7.2
		Pollution	No explicit management actions	7.6, 7.7, 7.8,
Marine Reptiles				
Short-nosed seasnake	Approved Conservation Advice on *Aipysurus apraefrontalis* (short-nosed seasnake) (2011)	Degradation of reef habitat	Monitor known populations to identify key threats.	7.4, 7.5, 7.5.6.5, 7.7, 7.8

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
			Ensure there is no anthropogenic disturbance in areas where the species occurs, excluding necessary actions to manage the conservation of the species.	
Leaf-scaled Seasnake	Approved Conservation Advice for *Aipysurus foliosquama* (Leaf-scaled Sea Snake) (2011)	Habitat degradation	No explicit relevant management actions	7.4, 7.5, 7.5.6.5, 7.7, 7.8
All marine turtles	National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023)	Light pollution	The aim of the Guidelines is that artificial light will be managed so wildlife is: Not disrupted within, nor displaced from, important habitat Able to undertake critical behaviours such as foraging, reproduction and dispersal. Best practice lighting design incorporates the following design principles: Start with natural darkness and only add light for specific purposes. Use adaptive light controls to manage light timing, intensity and colour. Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill. Use the lowest intensity lighting appropriate for the task. Use non-reflective, dark-coloured surfaces. Use lights with reduced or filtered blue, violet and ultra-violet wavelengths.	6.2
	Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)	Marine debris	Reduce impacts from marine debris: Support the implementation of the EPBC Act Threat Abatement Plan for the impacts of marine debris on vertebrate marine life.	7.3
		Vessel disturbance	Vessel interactions identifies as a threat; no specific management actions	6.17.2

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
			in relation to vessels prescribed in the plan.	
		Light pollution	Minimise light pollution: Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats. Develop and implement best practice light management guidelines for existing and future developments adjacent to marine turtle nesting beaches. Identify the cumulative impact on turtles from multiple sources of onshore and offshore light pollution.	6.2
Loggerhead turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Loggerhead turtle – WA genetic stock Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference	Refer above to: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023) Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	6.1
		Marine debris		7.3
		Climate variability and change		6.3
		Deteriorating water quality		6.6, 6.7,6.8, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Vessel disturbance		7.2
		Loss of habitat and/or habitat modification		7.2, 7.3
		Light pollution		6.2
Green turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Green turtle –North West Shelf (NWS) genetic stock (NWS), Scott-Browse genetic stock (ScBr), Ashmore genetic stock (AR) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference	Refer above to: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023) Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	6.1
		Climate variability and change		6.3
		Deteriorating water quality		6.6, 6.7,6.8,7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Marine debris		7.3
		Vessel disturbance		7.2
		Light pollution		6.2

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
Leatherback turtle, leathery turtle	Approved Conservation Advice on *Dermochelys coriacea* (2008) National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Boat strike	Refer above to: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023) Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018) Key management actions identified in the conservation advice are in the Recovery Plan for Marine Turtles in Australia (2017) relevant to the Leatherback Turtle	7.2
		Changes to breeding sites		6.4, 0, 7.2, 7.3
		Marine debris		7.3
		Noise interference		6.1
		Deteriorating water quality		6.6, 6.7,6.8, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Loss of habitat		7.2, 7.3
		Vessel disturbance		7.2
		Light pollution		6.2
Hawksbill turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference	Refer above to: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023) Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	6.1
		Deteriorating water quality		6.6, 6.7,6.8, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Marine debris		7.3
		Climate variability and change		6.3
		Loss of habitat		7.2, 7.3
		Vessel disturbance		7.2
		Light pollution		6.2
Flatback turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Flatback turtle – Pilbara coast genetic stock (Pil), South-west Kimberley coast genetic stock (swKim) and Cape Domett (CD) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference	Refer above to: National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Commonwealth of Australia, 2023) Recovery Plan for Marine Turtles in Australia 2017–2027 (Commonwealth of Australia, 2017)	6.1
		Deteriorating water quality		6.6, 6.7,6.8, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Marine debris		7.3
		Loss of habitat		7.2, 7.3
		Vessel disturbance		7.2

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
		Light pollution	Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	6.2
Fish and sharks				
Whale shark	Approved Conservation Advice for *Rhincodon typus* (whale shark) (2015)	Marine debris	Minimise offshore developments and transit time of large vessels in areas close to marine features likely to correlate with Whale Shark aggregations along the northward migration route that follows the northern Western Australian coastline along the 200 m isobath (as set out in the Conservation Values Atlas, DoE, 2014). Implement measures to reduce adverse impacts of habitat degradation and/or modification.	7.3
		Climate change		6.3
		Boat strike from large vessel		7.2
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) (2014) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Ecosystem effects as a result of habitat modification and pollution effects	Review the level and spatial extent of protection measures at key aggregation sites to ensure appropriate levels of protection, and a consistent approach to the designation and implementation of protective measures, are applied. Use BIAs to help inform the development of appropriate conservation measures, including through the application of advice in the marine bioregional plans on the types of actions which are likely to have a significant impact on the species and updating such conservation measures as new information becomes available.	7.2, 7.3
		Climate variability and change including sea temperatures and ocean acidification	No explicit relevant management actions: climate change identified as a threat.	6.3
		Marine debris	No explicit management actions for non-fisheries related industries (note that management actions in the plan relate largely to management of fishing waste (for example 'ghost' gear), and	7.3

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
			State and Commonwealth management through regulation.	
Great white shark	Recovery Plan for the White Shark (*Carcharodon carcharias*) (2013)	Ecosystem effects as a result of habitat modification	No explicit relevant management actions: habitat modification and climate identified as a threat	7.2, 7.3
Dwarf sawfish	Approved Conservation Advice on *Pristis clavata* (dwarf sawfish) (2009)	Habitat degradation and modification	Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	7.2, 7.3
	Sawfish and River Sharks Multispecies Recovery Plan (2015)			
Green sawfish	Approved Conservation Advice on *Pristis zijsron* (green sawfish) (2008)	Habitat degradation and modification	Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	7.2, 7.3
	Sawfish and River Sharks Multispecies Recovery Plan (2015)			
Freshwater sawfish	Commonwealth Conservation Advice for *Pristis pristis* (largetooth sawfish) (2014)	Commercial, recreational, Indigenous, illegal, unreported and/or unregulated fishing	Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	7.2, 7.3
		Habitat degradation and modification		7.2, 7.3
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	Habitat degradation and modification		7.2, 7.3
Northern river shark	Approved Conservation Advice for *Glyphis sp. C* (Northern River Shark) (2014)	Commercial, recreational, Indigenous, illegal, unreported and/or unregulated fishing	Identify risks to important sawfish and river shark habitat and measures needed to reduce those risks.	7.2, 7.3
		Habitat degradation and modification		7.2, 7.3
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	Habitat degradation and modification		7.2, 7.3
Birds				
All seabirds and shorebirds	National Light Pollution Guidelines for Wildlife (DCCEEW 2023)	Habitat modification	The aim of the Guidelines is that artificial light will be managed so wildlife is: Not disrupted within, nor displaced from, important habitat Able to undertake critical behaviours such as foraging, reproduction and dispersal.	7.2, 7.3
		Light pollution		6.2

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
			Best practice lighting design incorporates the following design principles: Start with natural darkness and only add light for specific purposes. Use adaptive light controls to manage light timing, intensity and colour. Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill. Use the lowest intensity lighting appropriate for the task. Use non-reflective, dark-coloured surfaces. Use lights with reduced or filtered blue, violet and ultra-violet wavelengths.	
Seabirds	Wildlife Conservation Plan for Seabirds (CoA 2020)	Anthropogenic disturbance	No explicit relevant management actions	7.2, 7.3
		Climate change		6.3
		Invasive species		7.1
		Pollution (marine debris, light, water)		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Habitat loss or modification		7.2, 7.3
Migratory shorebirds	Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015)	Habitat loss and degradation	No explicit relevant management actions that relate to the activity	7.2, 7.3
		Climate change and variability		6.3
		Pollution (marine debris, light, water)		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Sharp-tailed Sandpiper	Conservation advice for *Calidris acuminata* (sharp-tailed sandpiper) (DCCEEW 2024b) Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015)	Climate change	No explicit relevant management actions: oil pollution recognised as a threat.	6.3
		Chronic and acute pollution		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Red knot	Approved Conservation Advice for *Calidris canutus* (red knot) (2024) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation	No explicit relevant management actions: oil pollution recognised as a threat.	7.2, 7.3
		Climate change		6.3
		Pollution/contamination impacts		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
Great knot	Approved Conservation Advice *Calidris tenuirostriss* Great Knot (2024) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation	No explicit relevant management actions that relate to the activity	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
Southern giant petrel	National Recovery Plan for Albatrosses and Petrels (2022) Background paper, population status and threats to albatrosses and giant petrels listed as threatened under the EPBC Act 1999 (2011)	Marine pollution	No explicit relevant management actions that relate to the activity	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Habitat loss, disturbance and modifications		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Northern giant-petrel	National Recovery Plan for Albatrosses and Petrels (2022) Background paper, population status and threats to albatrosses and giant petrels listed as threatened under the EPBC Act 1999 (2011)	Marine pollution	No explicit relevant management actions that relate to the activity	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Habitat loss, disturbance and modifications		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
Greater sand plover	Approved Conservation Advice *Charadrius leschenaultia* greater sand plover (2023) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation	No explicit relevant management actions: oil pollution recognised as a threat.	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Pollutant/contaminant impacts		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Lesser sand plover	Approved Conservation Advice *Charadrius mongolus* lesser sand plover (2016) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation	No explicit relevant management actions that relate to the activity; pollution recognised as a threat.	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Pollutant/contaminant impacts		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Curlew sandpiper	Approved Conservation Advice for *Calidris ferruginea* (curlew sandpiper) (2023) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation from pollution	No explicit relevant management actions: oil pollution recognised as a threat.	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
Eastern curlew	Approved Conservation Advice for *Numenius madagascariensis* (far eastern curlew) (2023)	Habitat loss and degradation from pollution	No explicit relevant management actions; habitat loss and degradation recognised as a threat	7.4, 7.5, 7.5.6.5, 7.7, 7.8
Western Alaskan bar-tailed godwit		Habitat loss and degradation		7.4, 7.5, 7.5.6.5, 7.7, 7.8

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
	Approved Conservation Advice for *Limosa lapponica baueri* (bar-tailed godwit (western Alaskan)) (2024)	Pollution/contamination impacts	No explicit relevant management actions: oil pollution recognised as a threat.	7.4, 7.5, 7.5.6.5, 7.7, 7.8
Northern Siberian bar-tailed godwit	Approved Conservation Advice for *Limosa lapponica menzbieri* (Yakutian bar-tailed godwit) (2024)	Habitat loss and degradation	No explicit relevant management actions that relate to the activity	7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Pollution/contamination impacts		7.4, 7.5, 7.5.6.5, 7.7, 7.8
Australian fairy tern	Commonwealth Conservation Advice on *Sternula nereis nereis* (fairy tern) (2011) National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis) (2020)	Oil spills	No explicit relevant management actions: oil pollution recognised as a threat.	7.5, 7.5.6.5, 7.7, 7.8
		Habitat loss, disturbance and modifications		7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
Campbell albatross	National Recovery Plan for Albatrosses and Petrels 2011-2016 (DSEWPaC, 2022)	Marine pollution	No explicit relevant management actions that relate to the activity	7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3
		Habitat loss, disturbance and modifications		7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
White-winged fairy wren	Approved Conservation Advice for *Malurus leucopterus edouardi* (White-winged Fairy-wren (Barrow Island))	Habitat loss, disturbance and modification	No explicit relevant management actions that relate to the activity	7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Night parrot	Conservation Advice *Pezoporus occidentalis* night parrot (2016)	Threats to species are likely to vary across its range	No explicit relevant management actions that relate to the activity	7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Red-tailed tropicbird	Conservation Advice for Phaethon rubricauda westralis (Indian Ocean red-tailed tropicbird) (2023) Wildlife Conservation Plan for Migratory Seabirds (2020)	Climate variability and change	No explicit relevant management actions that relate to the activity	6.3
		Marine pollution		7.2, 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Habitat loss, disturbance and modification		7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
Australian painted snipe	Approved Conservation Advice for *Rostratula australis* (Australian painted snipe) (2013) National Recovery Plan for the Australian Painted Snipe (Rostratula australis) (2022a)	Habitat loss and degradation	No explicit relevant management actions: oil pollution recognised as a threat.	7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Oil spills		7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Marine plastics/ debris		7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity	Relevant conservation actions	Addressed in EP Section
		Marine pollution		7.2, 7.4, 7.5, 7.5.6.5, 7.7, 7.8
		Climate variability and change		6.3

3.2.7 Socio-economic Receptors

Socio-economic activities that may occur in the operational area and EMBA include cultural features, commercial fishing, oil and gas exploration and production, and, to a lesser extent, recreational fishing, and tourism.

More detailed descriptions of socio-economic consideration are provided in *Values and Sensitivities of the Western Australian Marine Environment* (EA-00-RI-10062, Appendix C).

3.2.7.1 Commercial fisheries

Offshore and coastal waters in the North-west Marine Region support a valuable and diverse commercial fishing industry. The major fisheries in the Pilbara region target tropical finfish, large pelagic fish, crustaceans (prawns and scampi) and pearl oysters (Newman et al. 2023).

These NWS region fisheries are managed by either the Department of Primary Industries and Regional Development (DPIRD) (State fisheries) with specific management plans, regulations and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 199*4; or by Australian Fisheries Management Authority (AFMA) who manages Commonwealth fisheries (within the 200 nautical mile Australian Fishing Zone).

Commonwealth and State fisheries overlapping with the operational area and the EMBA are illustrated in Figure 3-15 and Figure 3-16. Table 3-11 describes each of these fisheries and indicates which events associated with the activity may impact on these.

Previous consultation with DPIRD has identified commercial fishing interests that exist in, or in close proximity to, proposed activities under this EP. Further, Santos continually updates its understanding of the fisheries through reviews of annual status of the fishery reports published by DPIRD and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), other relevant fisheries management publications, and fishery catch and effort data.

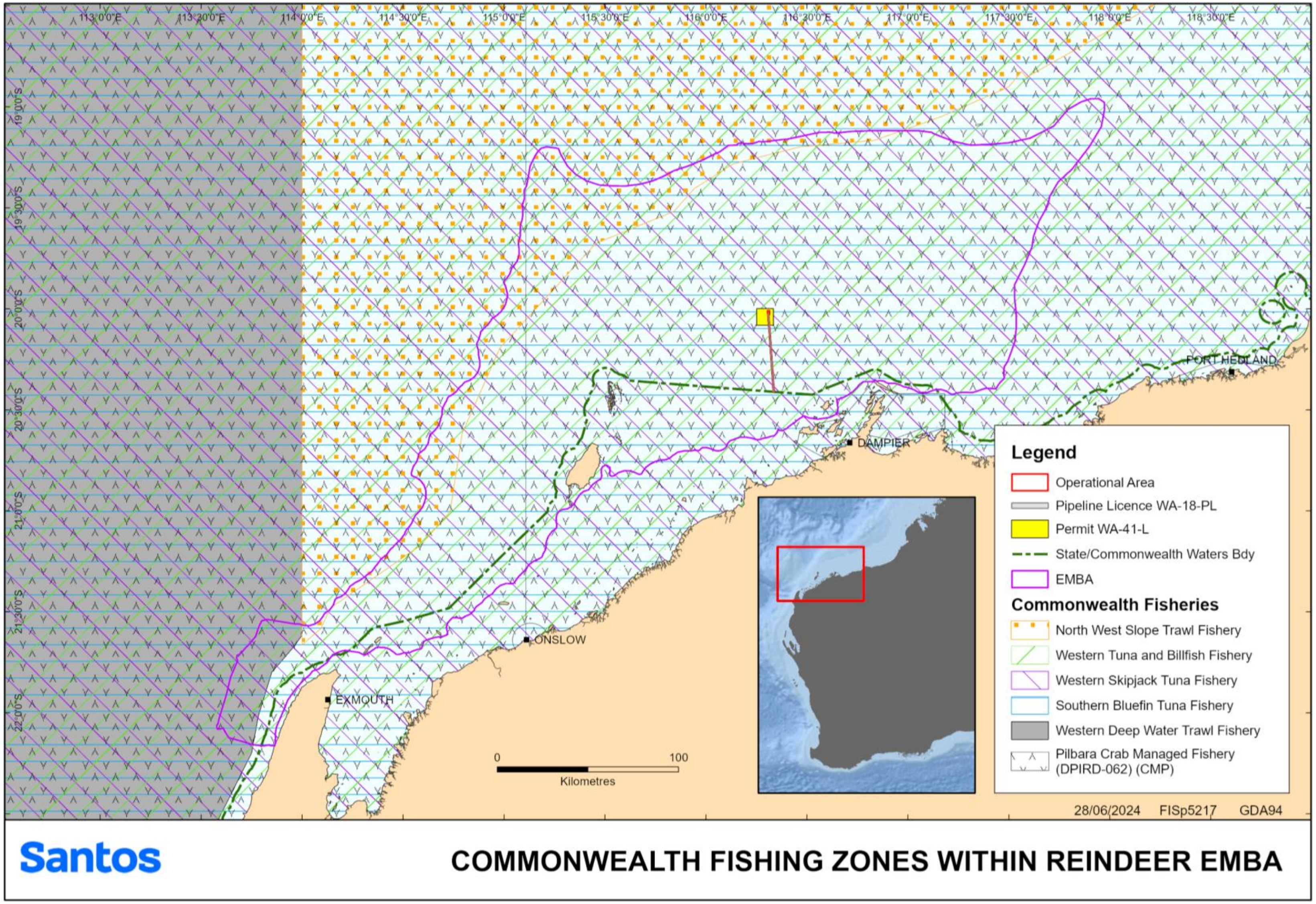

Figure 3-15: Commonwealth fishing zones within the EMBA

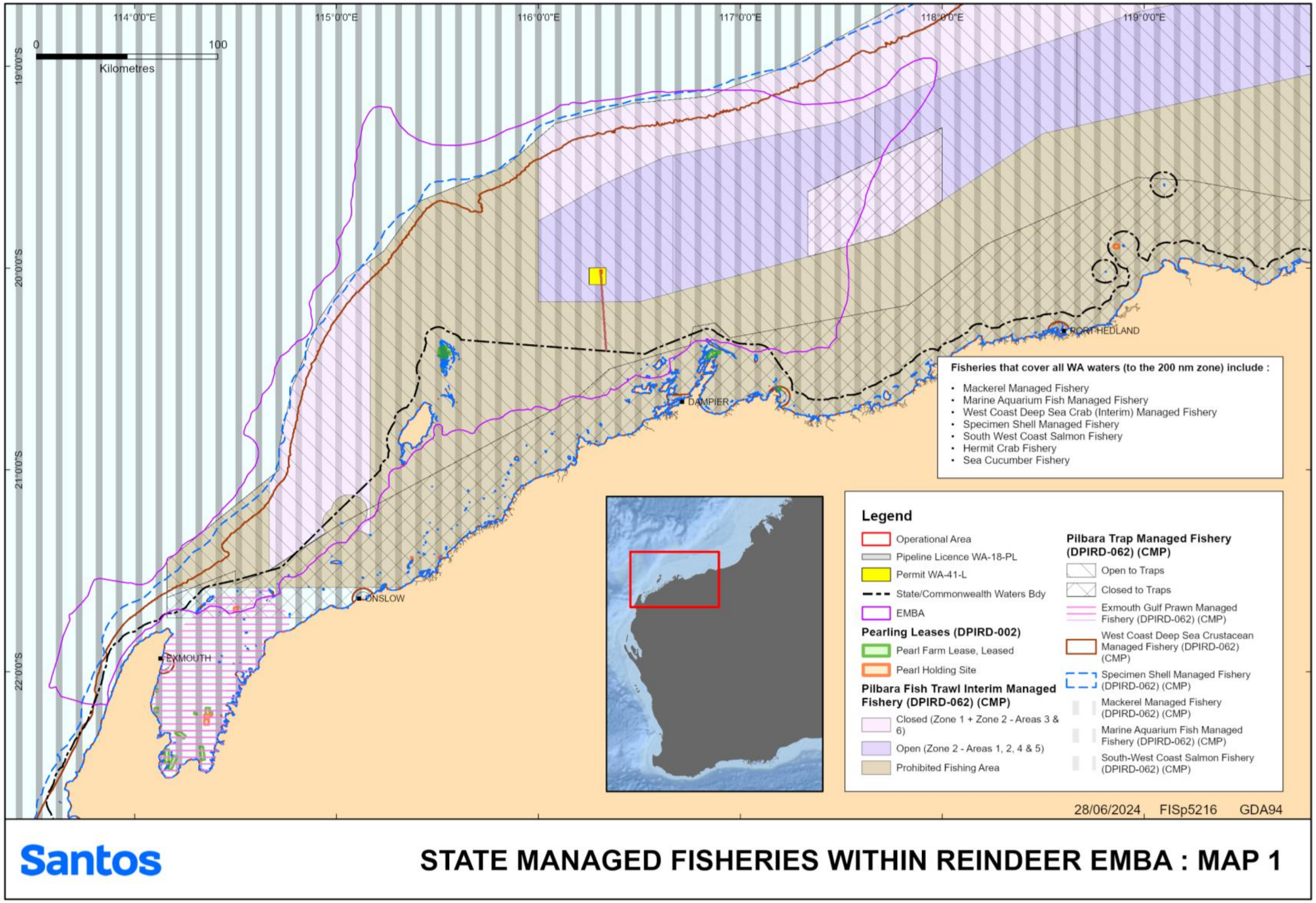

Figure 3-16: State commercial fisheries within the EMBA and the operational area Map 1

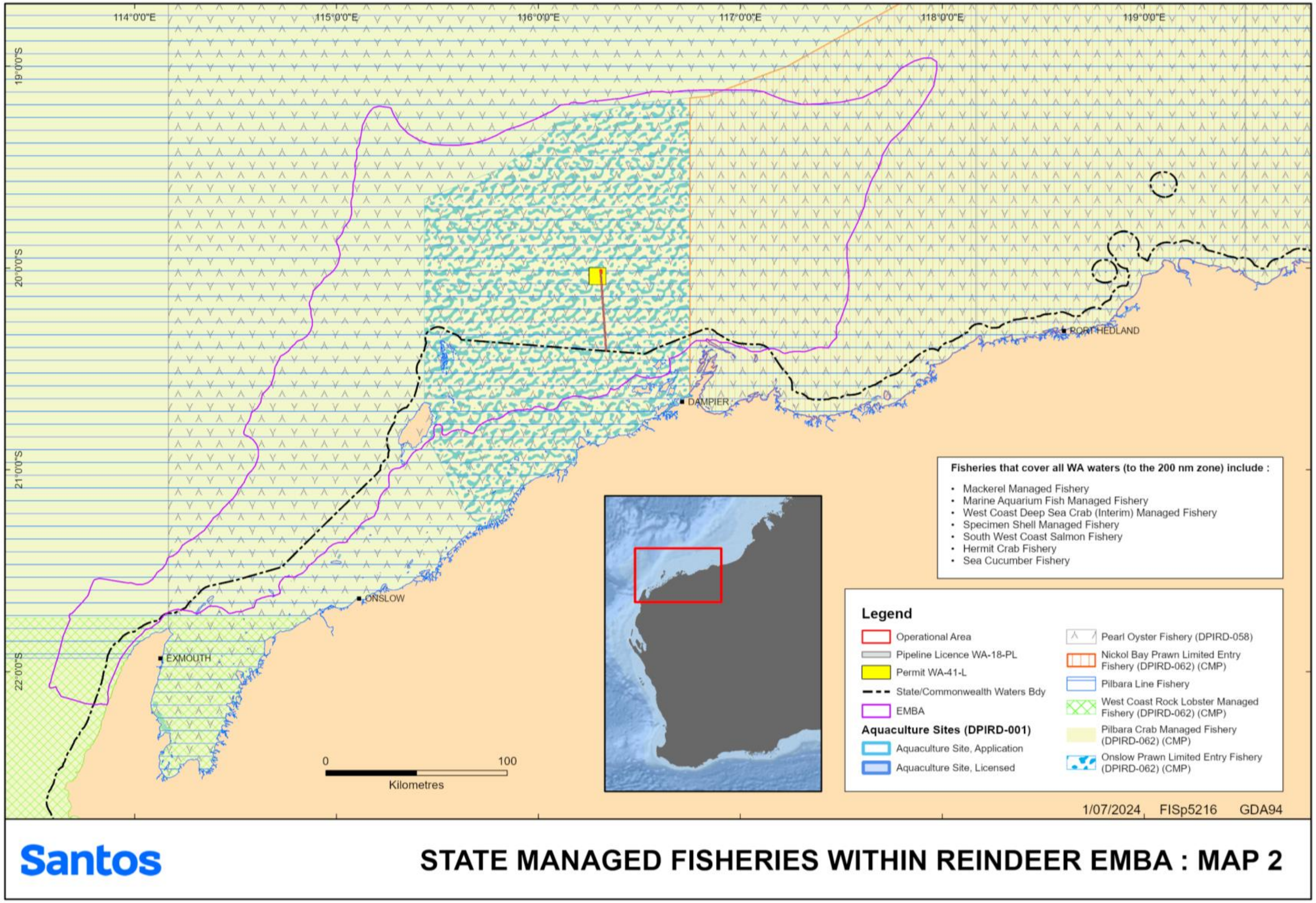

Figure 3-17 State commercial fisheries within the EMBA and the operational area Map 2

Table 3-11: State and Commonwealth commercial fisheries in the vicinity of the operational area and the EMBA

Fishery	Fishery Licence Area Overlap			Description	Relevant Events within the Operational Area and the EMBA
	Operational Area Presence	MEVA Presence	EMBA Presence		
Commonwealth Managed Fisheries					
Southern Bluefin Tuna Fishery	✓	✓	✓	Since 1992 juvenile Southern Bluefin Tuna have been targeted in the Great Australian Bight and waters off South Australia. The Southern Bluefin Tuna Fishery is only active in waters offshore south and south-eastern Australia, as confirmed in consultation with the Australia Southern Bluefin Tuna Association in consultation for previous company offshore activities, also illustrated in the ABARES Fishery Status Reports, 2023.	No active commercial fishing within the operational area in the past few years; however, fisheries overlap the EMBA, and therefore fishing vessels could be encountered in low density.
Western Tuna and Billfish Fishery	✓	✓		Extends westward from Cape York Peninsula (142°30′ E) off Queensland to 34° S off the Western Australian west coast. It also extends eastward from 34° S off the west coast of Western Australia across the Great Australian Bight to 141° E at the South Australia–Victoria border. Since 2005, there have been fewer than five vessels active in the Western Tuna and Billfish Fishery each year, which has reportedly declined from 50 active vessels in 2000 (ABARES Fishery Status Reports, 2023). In recent years fishing activity in the Western Tuna and Billfish Fishery has been concentrated in waters off south-west Western Australia, with occasional activity off South Australia (ABARES Fishery Status Reports, 2023).	
Western Skipjack Tuna Fishery	✓	✓	✓	There has been no fishing effort in the Skipjack Tuna Fishery since the 2009 season, during which activity concentrated off South Australia (ABARES Fishery Status Reports, 2023). No current effort on the NWS.	
North West Slope Trawl Fishery	×	×	✓	Extends from 114° E to around 125° E off the WA coast between the 200 m isobath and the outer limit of the Australian Fishing Zone. Targets scampi and prawns. Three vessels operated in the North West Slope Trawl Fishery in the 2021–22 season (4 in 2020–21) (ABARES Fishery Status Reports, 2023).	
Western Deepwater Trawl Fishery	×	×	✓	Demersal trawl seaward of the 200 m isobaths. Fishing effort for a diverse range of tropical and temperate species. The number of vessels active in the fishery and total hours trawled have been variable but relatively low since 2005–06. Two vessels were active in the Western Deepwater Trawl Fishery in 2021-22 and	

Fishery	Fishery Licence Area Overlap			Description	Relevant Events within the Operational Area and the EMBA
	Operational Area Presence	MEVA Presence	EMBA Presence		
				total trawl hours were ~76, down from 1108 in 2017-18 (ABARES Fishery Status Reports, 2023).	
State Managed Fisheries					
Pearl Oyster Managed Fishery	✓	✓	✓	Mostly operates March to June. Operates in shallow coastal waters along the north cast bioregion, Effort in the operational area is unlikely due to the depth and the dive-based method of collection. There has been no record of any fishing effort from this fishery in the operational area.	Operational area does occur within the boundaries of the fishery, but fishery activity is restricted to shallow diving depths below 35 m.
Onslow Prawn Limited Entry Fishery	✓	✓	✓	The boundaries of the Onslow Prawn Managed Fishery are 'all the Western Australian waters between the Exmouth Prawn Fishery and the Nickol Bay Prawn Fishery east of 114º39.9', on the landward side of the 200 m depth isobath'. There has been no record of any fishing effort from this fishery in the operational area.	As prawn trawling activities focus on inshore, shallow waters, planned events will not impact fishing activities; however, unplanned events may affect fishing activities in the inshore areas of the EMBA.
Mackerel Managed Fishery (Area 2)	✓	✓	✓	Surface trolling or handline. Near-surface trolling gear from vessels in coastal areas around reefs, shoals and headlands.	The operational area for this activity does intersect the Mackerel Managed Fishery Area 2. Very low level of activity was recorded in the FishCube data blocks (2013-2023) that overlap the operational area within the last ten years. Data indicates that the fishery had catch effort recorded and a vessel count of three or less vessels within the operational area The bulk of the total catch is taken in the Kimberley area.
Pilbara Demersal Scalefish Fisheries (includes trap and trawl fisheries)	✓	✓	✓	These fisheries use a combination of vessels, effort allocations (time), gear limits, plus spatial zones (including extensive trawl closures) as management measures. The Trawl Fishery lands the largest component of the catch of demersal finfish in the Pilbara (and North Coast Bioregion) comprising more than 50 scalefish species. In comparison, the Trap Fishery retains a subset of about 45–50 scalefish species.	The operational area intersects the trap and trawl fishery. FishCube data (2013-2023) identified the Trawl Fishery as being active in data blocks that overlap the operational area within the last ten years. The operational area overlaps both open and prohibited fishing areas for this fishery and the data indicates that the fishery had catch effort recorded and a vessel count of six or less vessels within the operational area. No trap fishing activity has been recorded in the operational area.

Fishery	Fishery Licence Area Overlap			Description	Relevant Events within the Operational Area and the EMBA
	Operational Area Presence	MEVA Presence	EMBA Presence		
Pilbara Line Fishery	✓	✓	✓	The Pilbara Line Fishery fishing boat licensees 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 Western Australia west along the parallel to the intersection of 21° 56′ S latitude and the boundary of the Australian Fishing Zone and north to longitude 120° E.	The operational area for this activity does intersect the Pilbara Line Fishery. No activity from this fishery has been recorded within the operational area.
Pilbara Crab Managed Fishery	✓	✓	✓	The boundaries of this fishery include waters between 114°39.9' E and 120° E, and on the landward side of the 200 m depth isobath.	Crabbing activity along the Pilbara coast is centred largely on the inshore waters from Onslow through to Port Hedland, with most commercial and recreational activity occurring in and around Nickol Bay (Johnston et al. 2023). No activity from this fishery has been recorded within the operational area.
Nickol Bay Prawn Managed Fishery	×	✓	✓	Primarily targets banana prawns using otter trawl methods along the western part of the NWS in coastal shallow waters.	According to the FishCube data (2013-2023) this fishery has been active with more three licences within the EMBA. No activity from this fishery has been recorded within the operational area.
Exmouth Gulf Prawn Managed Fishery	×	×	✓	Sheltered waters of Exmouth Gulf. Essentially the western half of the Exmouth Gulf (eastern part is a nursery ground). The Muiron Islands and Point Murat provide the western boundary; Serrurier Island provides the northern limit.	According to the FishCube data (2013-2023) this fishery has been active with more three licences within the EMBA. No activity from this fishery has been recorded within the operational area.
State Managed Fisheries (Whole of State)					
Marine Aquarium Fish Fishery	✓	✓	✓	The Marine Aquarium Fish Fishery license area extends into Commonwealth waters, spanning the coastline from the Northern Territory border to the South Australia border. Operators may fish year-round below the high tide water mark on the landward side of the 200 m isobath. The fishery is most active in waters from Esperance to Broome, with popular areas being around the Capes, Perth, Geraldton, Exmouth and Dampier. Effort in the operational area is unlikely due to the depth and the dive-based method of collection. Unlikely to occur.	According to the FishCube data (2013-2023) the data indicates that the Marine Aquarium Managed Fishery has been active with less than three licences within the operational area. Disruption to fishing activities will not occur within the operational area from planned events, given the water depths these fisheries operate within; however, sites of the fishery within inshore areas of the EMBA may be affected by unplanned events.

Fishery	Fishery Licence Area Overlap			Description	Relevant Events within the Operational Area and the EMBA
	Operational Area Presence	MEVA Presence	EMBA Presence		
Specimen Shell Managed Fishery	✓	✓	✓	The Specimen Shell Managed Fishery spans the entire Western Australian coastline, with efforts concentrated in areas adjacent to population centres such as Broome, Exmouth, Perth, Mandurah, the Capes area and Albany. The main harvesting methods are by hand by divers operating from small vessels in shallow coastal waters or by wading along coastal beaches below the high-water mark.	
West Coast Deep Sea Crustacean Managed Fishery	✓	✓	✓	Baited pots targeting crabs. This fishery extends seaward from the 150 m isobath, north of Augusta to the Northern Territory border, which is outside the operational area but within the EMBA. Catch effort is concentrated in areas south of Exmouth; therefore, it will not interact with planned and unplanned events for this activity.	Disruption to this fishery will not result from planned or unplanned events.
South West Coast Salmon Fishery	✓	✓	✓	Although permitted to fish within the operational area and the EMBA, the fishery is biogeographically limited to the southwest coast.	
Abalone Managed Fishery	✓	✓	✓	The commercial fishery harvest method is a single diver working off a ‘hookah’ (surface-supplied breathing apparatus) using an abalone ‘iron’ to prise the shellfish off rocks.	Disruption is unlikely to occur in the operational area due to depths and method of collection. Unplanned events that may occur in the EMBA are also unlikely to disrupt fishing activities.

3.2.7.2 Recreational fisheries

Within the operational area, there are no known natural seabed features that would aggregate fishes and that are typically targeted by recreational fishers. Given the water depths and distance from the nearest mainland, it is unlikely recreational fishing would occur in the vicinity.

The EMBA is located within the North Coast Bioregion (Pilbara/Kimberly), which is a focal point for winter recreational fishing and is a key component of many tourist visits. The Dampier Archipelago, Lowendal Islands and Montebello Islands are popular offshore recreational fishing locations.

The predominant target species include tropical species such as tropical emperors, mangrove jack, trevallies, sooty grunter, threadfin, cods and catfish, and invertebrate species including blue swimmer crabs, mud crabs and squid. The offshore islands, coral reefs and continental shelf waters contain other species such as tropical snappers, cod, mackerel, sharks and tunas for recreational fishing opportunities (Gaughan, D.J. and Santoro, K. (eds). 2020).

3.2.7.3 Oil and gas industry

Various petroleum exploration and production activities have been undertaken within the NWS. Within the operational area the Pluto gas export pipeline transects the DC supply pipeline ~21 km south of the Reindeer WHP; ((Figure 2-1).

Vessels servicing oil and gas operations in the region may pass through the area en-route to facilities; however, since vessel transit is not classed as a petroleum activity, potential impacts to vessels are discussed under ‘Shipping’ above.

Oil and gas facilities occur within the EMBA, as do permits operated by other titleholders. As such, oil and oil and gas activities could be impacted by unplanned events.

3.2.7.4 Shipping

Shipping using NWS waters includes iron ore carriers, oil tankers and other vessels proceeding to or from the ports of Dampier, Port Walcott and Port Hedland; however, these are predominantly heading north from these ports. The Reindeer facilities reside between two shipping fairways, located ~50 km to the east and west of the boundary of the WHP (AMSA, 2012). There is also a shipping fairway ~25 km south of the Reindeer WHP which crosses the DC supply pipeline (Figure 3-18). The operational area does not overlap any major shipping lanes although vessel traffic may be encountered throughout the operational area as commercial vessels transit around the Montebello Islands and support vessels conduct operations with the offshore infrastructure, are illustrated in Figure 3-18.

3.2.7.5 Tourism

Tourism activities occur within the EMBA in areas such as Ningaloo Marine Park, Montebello Islands Barrow Island and the Dampier Archipelago. Popular water-based activities that may occur within the EMBA include fishing, swimming, snorkelling/diving, surfing/windsurfing/kiting and boating.

The nearest area where recreation is likely to occur is the Montebello Islands, which is located ~32 km from the operational area.

3.2.7.6 Defence

A Defence training Area (RAAF Base Learmonth) overlaps with EMBA. Designated military exercise areas occur over waters and airspace of the EMBA and may be activated following the required notifications. The defence training area is shown in Figure 3-19.

3.2.7.7 Cultural Features

3.2.7.7.1 Introduction

Santos acknowledges the tradition of the First Nations people of Australia includes a cultural and spiritual connection to their land and waters, including sea country. These connections are rooted in their traditional communal beliefs and practices. First Nations people view their land and waters as integral to their identity, culture, and spirituality and they have a deep respect for the natural world.

The cultural heritage of First Nations peoples includes a vast array of tangible and intangible cultural artifacts, practices and beliefs. The protected heritage of First Nations peoples is also of cultural value to Australia and the global community. The cultural value of First Nations protected heritage to Australia is evidenced and given force by a range of factors, including the laws, regulations and institutions established across Australia that are designed specifically to protect First Nations rights and interests in relation to sacred sites and other aspects of First Nations cultural heritage including the Native Title Act 1993 (Cth) (NT Act), Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth) (ATSIHP Act), Underwater Cultural Heritage Act 2018 (Cth) (UCH Act).

Country is an important concept to First Nations people and the term is often to describe family origins and associations with particular parts of Australia, both land and sea (Smyth, 2007). The expressions Country and Sea Country are used to refer to the land and waters which constitute Aboriginal traditional areas as ancestrally distinct and linguistically bounded geographic areas (Kearney et al, 2023 p106).

Country is inclusive of many environments that are ecologically, geographically, ancestrally and socially configured (Kearney et al 2023). For First Nations Indigenous People, Country is a combination of the land, sea, rivers and islands and all that they contain and sustain. “Country refers to more than just a geographical area: it is shorthand for all the values, places, resources, stories and cultural obligations associated with that geographical area.” (Smyth, 2007).

First Nations people in northwest WA continue to rely on coastal and marine environments and resources of the region for their cultural identity, health and wellbeing, and their domestic and commercial economies (Smyth, 2007).

Numerous different Indigenous groups have connections to different parts of Country. These family groups are representative of many different Indigenous language groups.

Submerged archaeological landscapes have recently been identified in WA through combined evidence of terrestrial ecology, coastal and marine geomorphology and sea-level studies (Benjamin et al 2020; McCarthy et al 2022). There is a potential for the existence of submerged landscapes with associated Aboriginal heritage values due to strong cultural connections between Traditional Owners and the sea (McCarthy et al 2022).

3.2.7.7.2 Sea country

Sea country is described in State, Territory and Commonwealth Marine Park Management Plans. The Australian Marine Parks North-west Marine Parks Network Management Plan 2018 defines sea country as “the areas of the sea that Aboriginal and Torres Strait Islander groups are particularly affiliated with through their traditional lore and customs”. Sea country is valued for Aboriginal cultural identity, health and wellbeing. Aboriginal people of north-western Australia have been sustainably using and managing their sea country for tens of thousands of years, in some cases since before rising sea levels created these marine environments (DNP, 2018).

A common feature of coastal Aboriginal cultures is the connectedness of land and sea: together they form a country of significant cultural sites and dreaming tracks of the creation ancestors (NOO, 2002). As a result, coastal environments are an integrated cultural landscape/seascape that is conceptually different from the broader Australian view of land and sea (NOO, 2002).

Animals can be totems for Aboriginal people. Aboriginal people share the land and water with animals and their relationship with totem animals is fundamental to continued practice and cultural responsibility; for food, health, shelter, cultural expression and spiritual wellbeing (VAHC, 2021). Caring for plants, animals and their habitats is therefore seen as a key way of expressing culture (VAHC, 2021).

It is recognised that spiritual corridors extend from terrestrial areas into nearshore and offshore waters, that a number of marine animals are totems for Indigenous people.

Aboriginal people use and actively manage the coastal and marine environments as a resource and to maintain cultural identity, health and wellbeing. Fishing, hunting and the maintenance of culture and heritage through ritual, stories and traditional knowledge continue as important uses of nearshore and adjacent areas.

Sea country is described in both State, Territory and Commonwealth Marine Park Management Plans. The Australian Marine Park Management Plans include the objective to provide for the protection and conservation of biodiversity and other natural, cultural and heritage values of marine parks. The plans define cultural values as “living and cultural heritage recognising Indigenous beliefs, practices and obligations for country, places of cultural significance and cultural heritage sites” (DNP, 2018). Australian Marine Park Management Plans list the Aboriginal people who have responsibilities for sea country in the Marine Parks, and the Native Title Representative Body for the region.

The PMST report determined the EMBA for this EP overlaps the North-west Marine Park network which is managed by the North-west Marine Parks Network Management Plan. The following information is considered correct at the time of writing from the North-West Marine Parks Network Management Plan 2018 (DNP, 2018).

Montebello Marine Park

At the commencement of this plan there was limited information on the cultural significance of this Marine Park. The Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Pilbara region.

Gascoyne Marine Park and Ningaloo Marine Park

The Gnulli people have responsibility for sea country in the Marine Park. The Yamatji Marlpa Aboriginal Corporation is the Native Title Representative Body for the Yamatji region.

These people/groups have been consulted, in some cases via representative prescribed body corporates as outlined in Section 4.

3.2.7.7.3 Indigenous Land use Agreements

An “Indigenous land use agreement” (ILUA) is a voluntary, legally binding agreement about the use and management of land or waters, made between one or more native title groups and non-native title interest holders in the ILUA area (such as grantee parties, pastoralists or governments).

The Register of Indigenous Land Use Agreements is kept by the Native Title Registrar in accordance with s199A of the NTA and includes a description of the ILUA area, the parties’ names, the term of the ILUA and other information as the Registrar considers is appropriate (s199B of the NTA).

Registration confers a contractual effect on the ILUA and binds all persons holding native title regardless as to whether they are already parties to the ILUA (s24EA of the NTA).

A search of the Native Title Register found the following:

- There are no Native Title or Indigenous Land Use Agreements (ILUAs) within the operational area
- Two ILUAs overlap the EMBA:
  - Kuruma Marthudunera and Yaburara and Coastal Mardudhunera Indigenous Land Use Agreement-Area Agreement
  - Cape Preston Project Deed (YM Mardie) Indigenous Land Use Agreement- Area Agreement

3.2.7.7.4 Indigenous Protected Areas

Indigenous Protected Areas (IPAs) are areas of land and sea that Traditional Owners have agreed to manage for biodiversity conservation. IPAs represent more than 50% of National Reserve System.

The Sea Country Indigenous Protected Areas (IPA) Program seeks to increase the area of sea in IPAs to strengthen the conservation and protection of Australia’s unique marine and coastal environments, while creating employment and economic opportunities for Indigenous Australians.

A search of the Native Title Register identified no IPAs within the operational area or EMBA.

3.2.7.7.5 Aboriginal Cultural Heritage Inquiry System

The Department of Planning, Lands and Heritage (DPLH) Aboriginal Cultural Heritage Inquiry System (ACHIS) provides information about Aboriginal sites (as defined under the Aboriginal Heritage Act 1972 (WA)) in Western Australia. To identify Aboriginal sites that may be affected by the Activities, a search of the ACHIS (undertaken November 2023, DPLH, 2023) (Appendix E) indicated there are:

- no registered Aboriginal sites within the operational area
- 28 registered Aboriginal sites within the EMBA, mainly located on Rosemary Islands

3.2.8 Windows of sensitivity

Timing of peak activity for threatened and migratory species and other relevant, significant sensitivities is given in Table 3-12.

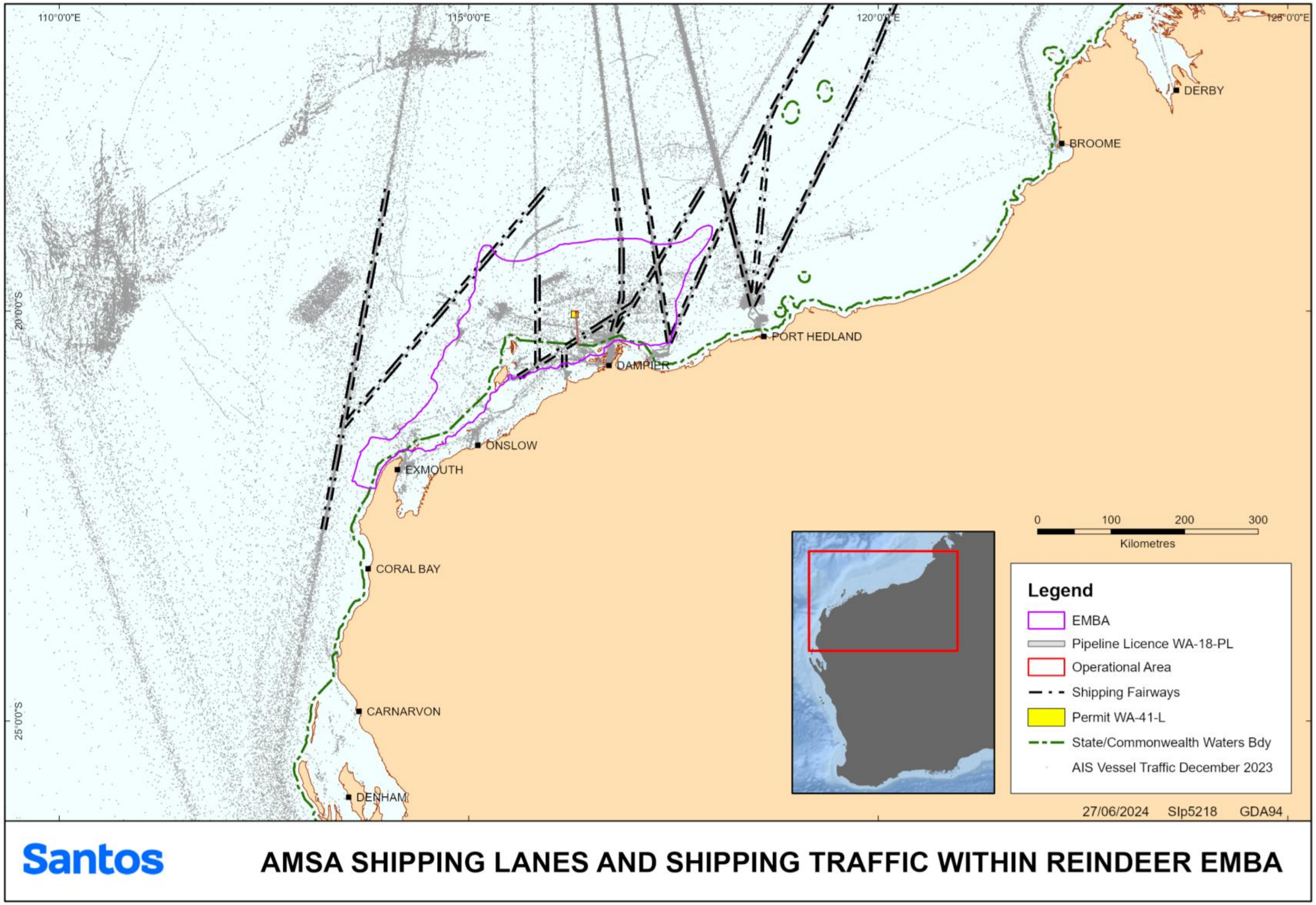

Figure 3-18: Shipping traffic and AMSA shipping routes within the EMBA

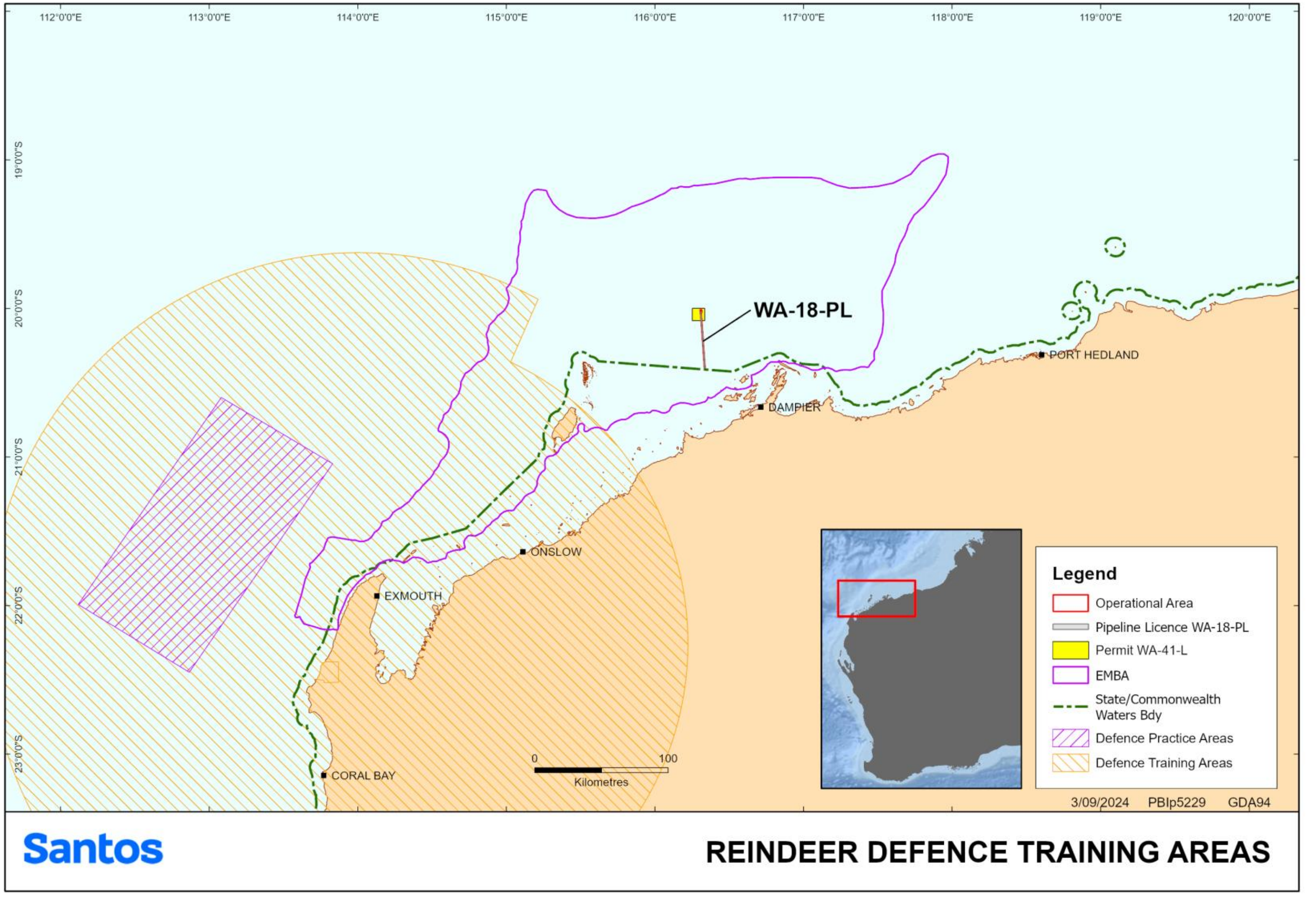

Figure 3-19: Defence training area within the EMBA

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Table 3-12: Windows of sensitivity in the vicinity of the EMBA

Categories	Receptors (Critical Life Cycle Stages)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Physical Environment and Habitats	Non-coral benthic invertebrates												
	Coral (spawning periods)												
	Macroalgae	growing				shedding fronds				growing			
	Other benthic habitats												
Marine Fauna (incl. Threatened/ Migratory Species)	**Fish/Sharks and Fisheries Species**												
	Whale sharks			aggregations at Ningaloo Coast									
	Fisheries species spawning/aggregation times:[1]												
	Baldchin groper												
	Blacktip shark												
	Crystal crab												
	Goldband snapper												
	King George whiting												
	Pink snapper												
	Rankin cod												
	Red Emperor												
	Spangled Emperor												
	Sandbar shark												
	Spanish mackerel												
	Marine Mammals												

Categories	Receptors (Critical Life Cycle Stages)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Dugong (breeding)		breeding							breeding			
	Humpback whale (migration)						northern			southern			
	Blue whale (migration)					northern						southern	
	Marine Reptiles												
	Hawksbill turtle (resident adult and juveniles[2])		Widespread throughout North West Shelf waters; highest density of adults and juveniles over hard bottom habitat (coral reef, rocky reef, pipelines etc.)										
	Hawksbill turtle (mating aggregations[2])												
	Hawksbill turtle (nesting and internesting[2])												
	Hawksbill turtle (hatching[1])												
	Flatback turtle (resident adult and juveniles[2])		Widespread throughout North West Shelf waters; increased density over soft bottom habitat 10–60 m deep; post hatchling age classes and juveniles spread across shelf waters										
	Flatback turtle (mating aggregations[2])												
	Flatback turtle (nesting and internesting[2])												
	Flatback turtle (hatching[2])												
	Flatback turtle (nesting[2])												
	Green turtle (resident adult and juveniles[2])		Widespread throughout the North West Shelf waters; highest density associated with seagrass beds and macroalgae communities; high density juveniles in shallow waters off beaches, among mangroves and in creeks										
	Green turtle (mating aggregations[2])												
	Green turtle (nesting and internesting[2])												
	Green turtle (hatching[2])												
	Loggerhead turtle (resident adult and juveniles[2])		Widespread throughout the North West Shelf waters; increased density associated with soft bottom habitat supporting their bivalve food source; juveniles associated with nearshore reef habitat										
	Loggerhead turtle (mating aggregations[2])												
	Loggerhead turtle (nesting and internesting[2])												

Categories	Receptors (Critical Life Cycle Stages)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Loggerhead turtle (hatching[2])												
	Leatherback turtle	Can occur at low density across the North West Shelf year-round											
	Short-nosed seasnake	Can occur at low density across the North West Shelf year-round											
	Seabirds												
	Terns, shearwaters, petrels (nesting)												
	Commercial Managed Fisheries												
	Oil and Gas												
	Shipping												
	Tourism/Recreational	Non applicable											

Key/Notes		Peak activity, presence reliable and predictable.	[1] Information provided from Department of Fisheries consultation.
		Lower level of abundance/activity/presence.	[2] Information provided by K. Pendoley.
		Very low activity/presence.	
		Activity can occur throughout the year.	
		Proposed timing of activity.	

4. Stakeholder consultation

4.1 Consultation background

Santos has undertaken consultation with relevant persons for this EP in compliance with OPGGS(E)R consultation requirements, applicable case law and applicable guidance (e.g. NOPSEMA guidance issued in May 2023 and subsequent guidance in May 2024).

Consultation with relevant persons under section 25 of the OPGGS(E)R commenced in May 2024, building on Santos' long history of consultation in the region to support existing Reindeer / Devil Creek Operations, which commenced operations in 2011.

Santos' consultation methodology for this EP is outlined in Section 4.5, with consultation activities undertaken in two phases:

- Preliminary consultation (30 May – 28 June 2024) – this included:
  - activities to allow authorities, persons and organisations opportunities to self-identify as relevant persons
  - engagement with potential relevant persons to confirm consultation expectations. Potential relevant persons that did not provide any feedback during preliminary consultation were carried into the consultation phase.
- Consultation (28 June – 29 July 2024) – activity-based consultation activities seeking feedback from relevant persons to inform development of this EP.

Santos undertook consultation with some authorities, persons and organisations outside of these consultation phases given existing relationships, consultation preferences and standing meeting and consultation arrangements.

A summary report of the consultation carried out under section 25 OPGGS(E)R is included at Table 4-9.

Section 8.13 includes Santos' post EP acceptance consultation implementation strategy for activities covered by this EP in accordance with Regulation 22(15) of the OPGGS(E)R.

4.2 OPGGS(E) R Consultation Requirements

Table 4-1: Consultation requirements under the OPGGS(E)R

OPGGS(E)R 2023 Requirements
Section 24
The environment plan must contain the following: a) a statement of the titleholder's corporate environmental policy; b) a report on all consultations under section 25 of any relevant person by the titleholder, that contains: (i) a summary of each response made by a relevant person; and (ii) an assessment of the merits of any objection or claim about the adverse impact of each activity to which the environment plan relates; and (iii) a statement of the titleholder's response, or proposed response, if any, to each objection or claim; and (iv) a copy of the full text of any response by a relevant person; (c) details of all reportable incidents in relation to the proposed activity.
Section 28(1)
If NOPSEMA's provisional decision under section 27 is that the environment plan includes material apparently addressing all the provisions of Division 2 (Contents of an environment plan), NOPSEMA must publish on NOPSEMA's website as soon as practicable: a) the plan with the sensitive information part removed; and b) the name of the titleholder who submitted the plan; and c) a description of the activity or stage of the activity to which the plan relates; and d) the location of the activity; and e) a link or other reference to the place where the accepted offshore project proposal (if any) is published; and f) details of the titleholder's nominated liaison for the activity.

OPGGS(E)R 2023 Requirements
Note: If the plan is a seismic or exploratory drilling environment plan, NOPSEMA must also publish an invitation for public comment on the plan: see section 30.

4.3 Government and Industry Guidance

Santos has considered the following NOPSEMA guidance in developing its consultation activities and approach:

- GL2086 – Consultation in the course of preparing an environment plan (EP Consultation Guideline) (NOPSEMA, 2023; 2024)
- GN1847 – Responding to public comment on Environment Plans (NOPSEMA, 2022a)
- GL1887 – Consultation with Commonwealth agencies with responsibilities in the marine area (NOPSEMA, 2024)
- GL1721 – Environment Plan decision making (NOPSEMA, 2024c)
- GN1344 – Environment Plan content requirement (NOPSEMA, 2024b)
- GN1488 – Oil Pollution Risk Management (NOPSEMA, 2021)
- GN1785 – Petroleum activities and Australian Marine Parks: A guidance note to support environmental protection and effective consultation (Australian Government, 2024) jointly released by NOPSEMA and Parks Australia.
- .

Santos has also considered other government and industry guidance, including:

- International Standards Organisation
  - – ISO14001:2015 Environmental Management Systems Environmental management systems – Requirements with guidance for use
- Australian Fisheries Management Authority
  - – Petroleum industry consultation with the commercial fishing industry
- Australian Heritage Commission
  - Ask First – A guide to respecting Indigenous heritage places and values
- Commonwealth Department of Agriculture, Fisheries and Forestry
  - Fisheries and the Environment – Offshore Petroleum and Greenhouse Gas Act 2006
  - Offshore Installations Biosecurity Guide
- Commonwealth Department of Climate Change, Energy, the Environment and Water
  - Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999
- Commonwealth Ministerial Council on Mineral and Petroleum Resources
  - Principles for Engagement with Communities and Stakeholders
- International Association for Public Participation
  - Quality Assurance Standard for Community and Stakeholder Engagement
- 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 – Marine Oil Pollution: Response and Consultation Arrangements
  - WA Incident Management Plan: Marine Oil Pollution, September 2023
- Western Australian Fishing Industry Council
  - Commercial Fishing Consultation Framework for the Offshore Oil and Gas Sector

– Consultation Approach for Unplanned Events

4.4 Applicable Case Law and Guidance

In addition to considering the regulatory requirements and guidance set out above, in conducting relevant person consultation for the activities covered by this EP, Santos has considered the judgments of:

- Justice Bromberg in Tipakalippa v National Offshore Petroleum Safety and Environmental Management Authority (No. 2) [2022] FCA 1121
- the Full Federal Court in Santos NA Barossa Pty Ltd v Tipakalippa [2022] FCAFC 193 (Appeal Judgement)
- Justice Calvin in Cooper v National Offshore Petroleum Safety and Environmental Management Authority (No 2) [2023] FCA 1158.

The EP Consultation Guideline (NOPSEMA, 2023; 2024) provides a summary of the Full Federal Court's interpretation of "functions", "activities" and "interests" referenced in section 25(1)(d) of the OPGGS(E)R, adopted by NOPSEMA to assist in informing who may be a relevant person and how relevant persons may be identified, as defined in Table 4-2.

Table 4-2: Relevant persons term and guidance

Term	Interpretation
Functions	Refers to "a power or duty to do something"
Activities	To be read broadly and is broader than the definition of "activity" in section 5 of the OPGGS(E)R and is likely directed to what the relevant person is already doing
Interests	To be construed as conforming with the accepted concept of "interest" in other areas of public administrative law. Includes "any interest possessed by an individual whether or not the interest amounts to a legal right or is a proprietary or financial interest or relates to reputation"

Santos has also had regard to the purpose of consultation as outlined in the Appeal Judgment and EP Consultation Guideline (NOPSEMA, 2024), the emphasis that superficial or tokenistic consultation is not sufficient and that:

- consultation must be appropriate and adapted to the nature of each relevant person
- for each relevant person, the appropriate manner and method of consultation (including the nature of information, time periods for consultation and mode of communication) may differ
- there is good reason to adopt pragmatic and practical approaches to consultation conducted in accordance with section 25 of the OPGGS(E)R.

4.5 Santos' Consultation Methodology

4.5.1 Overview

Santos consults to ensure that any activity it is proposing under an EP is carried out in a manner:

- consistent with the principles of ecologically sustainable development set out in section 3A of the EPBC Act
- by which the environmental impacts and risks of the activity will be reduced to ALARP and to an acceptable level.

The consultation process is designed to assist Santos to further ascertain, understand and assess values and sensitivities of the environment (including ecosystems, people and communities, natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places) that may be affected by a proposed activity, and the potential environmental impacts and risks, through information obtained during consultations.

Santos may then refine or change its proposed control measures to address potential environmental impacts and risks of the activity based on that information or any claims or objections raised through consultation.

Santos' consultation methodology and process adopted in developing this EP comprised the following key steps:

- identifying potential relevant person categories
- identifying relevant persons

- providing opportunities for relevant persons to identify themselves if they wished to be consulted (e.g. through advertising, encouraging identified relevant persons to identify other potential relevant persons)
- consultation planning and preliminary consultation activities
- consulting relevant persons
- assessing the merits of objections or claims made by relevant persons about the adverse impact of each activity to which the EP relates
- providing responses to queries, requests and feedback.

As described in Section 4.5.2, Santos considered the spatial extent of the EMBA and the particular aspects of the relevant environment outlined in Section 3 as part of its process for identifying relevant persons.

However, the EMBA includes large areas where only unplanned activities such as a spill event with an unlikely probability of occurrence, could have any impact on the environment.

There is also significant conservatism associated with the EMBA based on low exposure values (as described in Section 3.1.1) which Santos has used in identifying the EMBA, and especially given the modelling process (Section 3.1.1) which combines a large number of individual unmitigated spill simulations.

The modelling at low exposure values is primarily used to inform Santos preparedness for potential spill response, and does not take into account any spill response mitigation activities which would be implemented and reduce the extent of the EMBA in the unlikely event of a spill.

Santos' methodology demonstrates a very broad capture of potential relevant persons, providing ample opportunities, as outlined in Sections 4.5.3 and 4.5.4, for relevant persons to self identify and provide input to the development of the EP if they feel they may be impacted by the activities.

Santos notes that there is a very low likelihood of impacts from planned activities or unplanned events to the respective functions, interests and activities of those relevant persons identified at the extremities of the EMBA. In recognition of this, our direct consultation effort has focused on those relevant persons most proximate to the Operational Area.

4.5.2 Identifying Relevant Persons

Santos considered the nature and location of the activity (and key component activities) (described in Section 2), the impacts of planned events and the risks of unplanned events (described in Sections 6 and 7).

Santos also considered the spatial extent of the EMBA by the activity (refer to Section 3.1.1) and the particular aspects of the relevant environment (refer to Section 3.2) as part of its process for identifying relevant persons.

The identification of relevant persons was an iterative process. Table 4-3 summarises the preliminary steps adopted by Santos to identify relevant persons.

Table 4-3: Preliminary identification methodology

Process steps
1. Identify the impacts of the planned activities and the risks and impacts of unplanned events.
2. Consider the spatial extent of the EMBA by the Activity for assessment of impacts and risks.
3. Consider and identify aspects of the environment that may be affected, having regard to: a. ecosystems and their constituent parts, including people and communities b. natural and physical resources c. the qualities and characteristics of locations, places and areas d. the heritage value of places e. the social, economic and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).
4. Identify relevant person categories, having regard to: a. aspects of the environment identified at Item 3 b. the departments or agencies of Commonwealth, State and Territory governments that could therefore be relevant c. the kinds of functions, interests or activities of people or organisations that could therefore be affected d. submissions received in response to Santos' advertisements asking relevant persons to identify themselves if they wished to be consulted e. any other person or organisation that the titleholder considers relevant. Update during consultation based on new information, if appropriate.
5. Identify relevant persons within relevant person categories, having regard to Items 1–4 above.

Table 4-4 outlines the environmental aspects within the EMBA (described in detail in Section 3) that Santos considered for the purpose of identifying relevant person categories.

Table 4-4: Environmental aspects considered for relevant person category identification

Aspects of the environment	EP Reference
Physical environment	3.2.2
Provincial bioregions	3.2.3
Benthic habitats	3.2.4
National heritage place and world heritage property	3.2.5.3
Marine parks	3.2.5.1
Wetlands of international and national importance	3.2.5.4
Key ecological features	3.2.5.2
Threatened and migratory fauna	3.2.6
Biologically important areas and critical habitat	3.2.6.1
Conservation advice, recovery plans and management plans	3.2.6.3
Commercial fisheries	3.2.7.1
Energy industry	3.2.7.3
Defence activities	3.2.7.6
Shipping	3.2.7.4
Recreation and tourism	3.2.7.5
Cultural features	3.2.7.7

The consideration of the environmental aspects resulted in identification of the following relevant person categories:

- Section 25(1)(a)(b)(c) of the OPGGS(E)R:
  - Commonwealth Government agency or authority
  - WA Government agency or authority.
- Section 25(1)(d)(e) of the OPGGS(E)R:
  - academic and research organisations
  - commercial fishing (Commonwealth-managed)
  - commercial fishing (WA–managed)
  - energy industry titleholders/operators
  - environmental conservation organisations
  - First Nations people and groups
  - infrastructure operators
  - industry associations
  - local government and recognised community reference/liaison groups
  - recreational fishing
  - tourism operators.

Santos then undertook the actions outlined in Table 4-5 to identify relevant persons within those categories. No action was required for the identification of international relevant persons for this EP as the EMBA does not enter international waters.

Table 4-5: Actions for identifying relevant persons by category

Relevant person Category	Actions to identify relevant persons
All relevant person categories	• Review of relevant regional historical consultation by Santos in the region

Relevant person Category	Actions to identify relevant persons
	• Review of identified relevant persons in publicly available EPs submitted by other Titleholders that may be relevant to proposed activities to be managed under this EP • Advertising as outlined in Table 4-8 • Review of information provided by or claims made by or on behalf of organisations who claimed to be relevant persons
Section 25(1)(a) of the OPGGS(E)R	
Commonwealth agency or authority to which the activities to be carried out under the environment plan may be relevant	• Review of government agency websites and directories to understand agency roles, functions and responsibilities • Review of NOPSEMA and government agency guidance on consultation expectations
Section 25(1)(b) and (c) of the OPGGS(E)R	
State and Territory departments/agencies	• Review of government agency websites and directories to understand agency roles, functions and responsibilities • Review of NOPSEMA and government agency guidance on consultation expectations
Section 25(1)(d) and (e) of the OPGGS(E)R	
Academic and research organisations	• Conducting key-word searches of publicly available online search engines, review media coverage and review organisation websites to identify organisations with reasonably ascertainable functions, interests or activities that may be affected, having regard to the region, activities or risks/impacts under this EP
Commercial fishing	• Review of Commonwealth and WA Government commercial fishing catch and effort data in the Operational Area • Review of fisheries entitled to fish in the EMBA
Energy industry	• Review of EMBA overlap with petroleum, greenhouse gas and any other NOPTA issued titles
Environmental conservation organisations	• Conducting key-word searches of publicly available online search engines, review media coverage and review organisation websites to identify organisations with reasonably ascertainable functions, interests or activities that may be affected, having regard to the region, activities or risks/impacts under this EP • Review of other publicly available information, e.g. websites of conservation organisations whose functions, interests or activities within the EMBA may be affected
First Nations people and groups	• Review of the Judgment and the Appeal Judgment • Review of EMBA overlap with Native Title determined areas and claims, ILUAs, registered / protected sacred sites, land rights and IPAs • Review of Representative Aboriginal/Torres Strait Island Bodies (RATSIBs) on Native Title website • Review of prescribed bodies corporate on Native Title website, where relevant • Conducting searches of public cultural heritage databases relevant to the EMBA • Review of marine park management plans relevant to the EMBA • Review of additional publicly available information sources, where relevant • Engagement with government departments/agencies with relevant knowledge or relevant responsibilities
Infrastructure operators	• Review of EMBA overlap with offshore and onshore infrastructure, such as submarine telecommunications cables or ports
Industry associations	• Review of industry representation of the following relevant person groups: – commercial fishing – local government authorities – local industry – recreational fishing – shipping

Relevant person Category	Actions to identify relevant persons
	– tourism operators
Local government and recognised community reference/liaison groups	• Review of EMBA overlap with boundaries of local government areas
Recreational fishing	• Review of EMBA overlap with areas of interest to recreational fishing • Review of potential presence of recreational fishing club members in the EMBA • Review of website information of relevant agencies/organisations that represent recreational fishing interests
Shipping	• Review of EMBA overlap with shipping fairways or areas of high marine traffic
Tourism operators	• Review of EMBA overlap with areas of interest to charter and tourism operators • Review of potential presence in the EMBA • Review of website information of relevant operators/organisations that represent commercial tourism interests with reasonably ascertainable functions, interests or activities that may be affected, having regard to the region, activities or risks/impacts under this EP

4.5.3 Public Awareness Campaign and Self-Identification Opportunities

In addition to undertaking the process for identification of potential relevant persons, as described above, Santos undertakes a range of activities to promote opportunities for other organisations or individuals to self-identify as potential relevant persons if they feel that their functions, interests or activities may be affected.

These promotional activities include public information campaigns using a range of delivery methods, including, radio, print media, targeted social media with links (where appropriate) to information about the proposed activities, risk and impacts.

Details of the public information campaign for this EP, including targeted efforts to ensure First Nations organisations and individuals are provided the same opportunities, are described in Section 4.5.4 and a schedule of advertising is included in Table 4-8. Santos also has an online self-nomination form on its Consultation Hub website where fact sheets and other consultation materials are published and available for download.

Such activities and information provide a more than reasonable opportunity for organisations and individuals to self-identify as a relevant person for the purpose of OPGGS(E)R section 25 consultation, where they consider themselves to have interests, functions or activities that may be affected by the planned activities and for relevant persons to provide their input.

Santos' process involves the provision of reasonable timeframes for the self-identification or nomination of others as relevant persons, for relevant persons to consider consultation information, ask questions and give their input and for Santos' consideration and assessment of the merits of objections and claims.

4.5.4 Identification and Consultation with First Nations People and Groups

In addition to the public awareness campaign and self-identification opportunities outlined above, Santos has developed a comprehensive process for identifying and undertaking effective consultation with First Nations relevant persons.

As with Santos' process for identifying relevant persons generally, this is an iterative process with multiple avenues of enquiry including, but not limited to, the following actions:

- Active steps to identify First Nations people and groups as per actions outlined in Table 4-5, including advertising broadly to ensure that relevant persons that are not otherwise identified by Santos' examination of the EMBA are given the opportunity to self-identify.
- Providing opportunities for relevant persons to provide input in EP development, including:
  - registered Native Title Prescribed Bodies Corporate (PBCs), groups associated with Native Title Determinations and groups in active Native Title Claims; Native Title Representative Bodies
  - groups who may be parties to Indigenous Protected Areas, or named in Indigenous Land Use Agreements
  - existing liaison committees or reference groups, where these committees or groups have been established between Native Title Parties, Native Title Representative Bodies and industry/government

- supporting the establishment of liaison committees or groups that are intended to be representative and able to speak on behalf communities where formal structures do not exist, and consulting such committees or groups
- individual First Nations people who self-identify as relevant (if any)
- asking identified persons and organisations (including relevant land councils) if there are other persons or organisations who may be a relevant person.

For this EP, Santos has provided consultation opportunities and supporting information to First Nations representative organisations listed in Table 4-7 acknowledging the use of a highly conservative EMBA (as described in Section 3) for the purpose of assisting to identify potentially relevant persons.

Santos acknowledges the tradition of First Nations people of Australia includes a cultural and spiritual connection to their land and waters and that communal cultural interests, including sea country, could extend into the EMBA. When considering the remote possibility of any major unplanned spill event, and the inherent conservatism of the EMBA, the likelihood of First Nations people having an interest that may be affected by the proposed activities (if such groups do have sea country or other interests) becomes increasingly unlikely with increasing distance from the operational area, where planned activities will occur.

This conservative approach (further described in Section 4.5.7) has ensured a very broad capture of potential interested relevant persons and provided them an opportunity to provide input if they feel they may be impacted.

Santos has provided consultation opportunities to PBCs given their responsibilities under the *Native Title Act 1993* (Cth) for representing Native Title holders who have been recognised by Australian law of their rights and interests to traditional land and waters.

Santos recognises that PBCs are bound by the traditional laws and customs of the native title group they represent. This includes, among other things, management and protection of cultural values.

Santos has since mid-2023 actively been working with PBCs to establish consultation agreements to support ongoing, regular and effective consultation and engagement activities. For this EP, Santos has arrangements in place with Buurabalayji Thalanyji Aboriginal Corporation and Wirrawandi Aboriginal Corporation.

4.5.5 Relevant Persons

A list of potentially relevant persons was developed through application of the above methodology for the purposes of undertaking preliminary consultation to confirm consultation expectations.

This consultation phase was supported by an advertising campaign outlined in Table 4-8 to raise public awareness about proposed activities and provide opportunities for authorities, persons or organisations to identify themselves as relevant persons.

Relevant persons consulted for this EP are listed in Table 4-6.

Table 4-6: List of relevant persons

Relevant person category	Summary of relevance
Section 25(1)(a) of the OPGGS(E)R: Departments or agencies of the Commonwealth to which the activities to be carried out under the environment plan may be relevant	
Australian Border Force (ABF) (Maritime Border Command)	ABF is Australia's border law enforcement agency and customs service. ABF's vessels undertake patrols as part of its surveillance and response activities.
Australian Fisheries Management Authority (AFMA)	AFMA is responsible for managing Commonwealth fisheries and is a relevant agency because the Activity has the potential to impact on fisheries resources in AFMA managed fisheries. AFMA expects petroleum operators to consult directly with fishing operators about all activities and projects which may affect day to day fishing activities. AFMA also provides industry association contacts for petroleum operators to use when consultation with fishing operators is required.
Australian Hydrographic Office (AHO)	AHO is responsible for maintaining and disseminating nautical charts, including the distribution of Notices to Mariners.
Australian Institute of Marine Science (AIMS)	AIMS is Australia's tropical marine research agency and is established under the *Australian Institute of Marine Science Act 1972* (AIMS Act).
Australian Maritime Safety Authority (AMSA) – maritime safety	AMSA is the statutory and control agency for maritime safety and vessel emergencies in Commonwealth Waters. AMSA is a relevant agency because the proposed offshore activities may impact on the safe navigation of commercial shipping in Australian waters.
Australian Maritime Safety Authority (AMSA) – marine pollution	AMSA is the statutory and control agency for maritime safety and vessel emergencies in Commonwealth Waters. AMSA is a relevant agency as one of its functions is to prevent and combat ship-sourced pollution in the marine environment.
Department of Agriculture, Forestry and Fisheries (DAFF) – Biosecurity (marine pests) (vessels, aircraft and personnel)	DAFF administers the *Biosecurity Act 2015* (Cth) which is designed to contain and/or deal with diseases and pests that may cause harm to human, animal or plant health or the environment in Australia. DAFF is a relevant agency for consultation because the Activity involves the movement of vessels into Australian territory and/or between Australian ports and offshore petroleum facilities.
Department of Agriculture, Forestry and Fisheries (DAFF) –Fisheries	DAFF has primary policy responsibility for promoting the biological, economic and social sustainability of Australian fisheries. DAFF is a relevant agency for consultation because the Activity has the potential to impact on fishing operations and/or fishing habitats in Commonwealth waters.
Department of Climate Change, Energy, the Environment and Water (DCCEEW) – Underwater Cultural Heritage (UCH)	DCCEEW protects Australia's natural environment and heritage sites, helps Australia respond to climate change and carefully manages water and energy resources. The Underwater Cultural Heritage branch at DCCEEW is responsible for administering the UCH Act. It is a relevant agency where an activity has the potential to directly or indirectly adversely impact protected UCH.
Department of Defence (DoD)	DoD is a relevant agency for consultation because: • the proposed Activity may impact DoD training and operational requirements, in that the EMBA overlaps DoD training areas. • the proposed Activity encroaches on known training areas and/or restricted airspace. • there is a risk of unexploded ordnance in the area where the Activity is taking place.
Department of Industry, Science and Resources (DISR)	DISR is a relevant agency for consultation because its responsibilities include offshore oil and gas development and safety and GHG storage.
Director of National Parks (DNP)	DNP is the statutory authority responsible for administration, management and control of Commonwealth marine reserves. The DNP is a Relevant Person for consultation where:

Relevant person category	Summary of relevance
	• the Activity or part of the Activity is within the boundaries of a proclaimed Australian Marine Park • activities proposed to occur outside a reserve may impact on the values within a Australian Marine Park; and / or • an environmental incident occurs in Commonwealth waters surrounding a Australian Marine Park and may impact on the values within the Australian Marine Park.
Section 25(1)(a) of the OPGGS(E)R: Departments or agencies of Western Australia to which the activities to be carried out under the environment plan may be relevant.	
Department of Biodiversity, Conservation and Attractions (DBCA)	DBCA is a relevant State agency responsible for the management of State marine parks and reserves and protected marine fauna and flora.
Department of Planning, Lands and Heritage (DPLH)	DPLH is responsible for WA state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters.
Department of Primary Industries and Regional Development (DPIRD) – Fisheries	DPIRD is responsible for managing Western Australian fisheries.
Department of Transport (DoT) – marine pollution	DoT has functions in relation to commercial vessel movements in the navigable waters of the State and seas adjacent to WA. Its interests extend to responding to an unplanned spill event through its Maritime Environmental Emergency Response unit.
Department of Jobs, Tourism, Science and Innovation (JTSI)	JTSI is a Western Australian Government statutory authority responsible for promoting Western Australia as a holiday destination.
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)	The NCWHAC provides advice to the Commonwealth and State Environment Ministers on the protection, conservation and management of the Outstanding Universal Value of the World Heritage area.
Pilbara Development Commission (PDC)	PDC is a Western Australian Government statutory authority dedicated to the economic and social development of the Pilbara region.
Western Australian Museum (WAM)	WAM maintains a database of shipwrecks off the Western Australian coast.
Section 25(1)(b) of the OPGGS(E)R: Department of the responsible Western Australian Minister	
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	DEMIRS is the department of the relevant State Minister and is required to be consulted under subregulation 11A (1) of the Environment Regulations.
Section 25(1)(d) of the OPGGS(E)R: Persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the environment plan	
Commercial fishing – Commonwealth managed	
Commonwealth-managed fisheries that overlap the EMBA (based on AFMA guidance): • North West Slope Trawl Fishery • Southern Bluefin Tuna Fishery • Western Deepwater Trawl Fishery • Western Skipjack Tuna Fishery • Western Tuna and Billfish Fishery	Santos has engaged representative organisations and Government agencies, on behalf of relevant fisheries, including providing information on those fisheries active in the operational area and those that are licenced to fish in the EMBA. No Commonwealth fisheries are active in the Operational Area

Relevant person category	Summary of relevance
Commercial fishing – Western Australia managed	
State fisheries that overlap with the EMBA and are active in the Operational Area (based on WAFIC guidance): • Mackerel Managed Fishery • Marine Aquarium Managed Fishery • Pilbara Fish Trawl Managed Fishery	Santos has engaged representative organisations and Government agencies, on behalf of relevant fisheries, including providing information on those fisheries active in the operational area and those that are licenced to fish in the EMBA.
Energy Industry	
Operators: • Beagle No.1 P/L • Carnarvon Energy • Chevron Australia P/L • Coastal Oil & Gas • Eni Australia • Finder Energy • Jadestone Energy • KATO Energy • Mobil Australia Resources Company • Skye Resources P/L • Vermillion O&G Australia • Woodside Energy	Titleholders within the EMBA.
Environmental conservation organisations	
Cape Conservation Group (CCG)	According to its website, CCG is a volunteer, not-for-profit organisation that is involved in protecting the terrestrial and marine environment of the North West Cape.
Protect Ningaloo	According to its website, the Protect Ningaloo campaign aims to protect Exmouth Gulf from the threat of industrialisation, and conserve its outstanding natural, cultural and social values.
First Nations People and groups	
The following groups may have interests that intersect the EMBA. Information was also provided to these organisations to help identify and consult groups or individuals whose spiritual or cultural connections to land and sea country in accordance with Indigenous tradition may be affected by proposed activities. In addition, targeted regional advertising was conducted to provide opportunity for individuals whose functions, interests and activities may be affected by the proposed activity to self-identify as relevant persons.	
First Nations Peoples and Groups – Representative Organisations (Western Australia)	
Murujuga Aboriginal Corporation (MAC)	The EMBA intersects national parks, islands and sea country managed by Murujuga Aboriginal Corporation.

Relevant person category	Summary of relevance
	Santos has consulted with MAC.
Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	The EMBA is adjacent to the Thalanyji Native Title determined area. Buurabalayji Thalanyji Aboriginal Corporation (BTAC) are the Registered Native Title Body Corporates holding native title on behalf of the Thalanyji people. Santos has consulted with BTAC.
Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC)	The EMBA intersects the Gnulli, Gnulli #2 and Gnulli #3 Native Title determined area, which is jointly managed by Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) and Yinggarda Aboriginal Corporation (YAC) The EMBA intersects the Ningaloo and Gascoyne Marine Parks, the management plan for which references NTGAC. NTGAC is the Registered Native Title Body Corporates holding native title that corresponds to the northern part of the Gnulli, Gnulli #2 and Gnulli #3 Native Title determination. NTGAC's nominated representative is YMAC. Santos has consulted with YMAC.
Ngarluma Aboriginal Corporation (NAC)	The EMBA is adjacent to the Ngarluma/ Yindjibarndi Native Title determined area, which is jointly managed by Ngarluma Aboriginal Corporation (NAC) and Yindjibarndi Aboriginal Determination. NAC manage the northern, coastal part of the determination. The EMBA intersects the Dampier Marine Park, the management plan for which references NAC. Santos has consulted with NAC.
Wirrawandi Aboriginal Corporation (WAC)	The EMBA intersects the Yaburara and Mardudhunera Native Title determined area. WAC is the Registered Native Title Body Corporates holding native title on behalf of the Yaburara and Mardudhunera people. The EMBA intersects the Dampier Marine Park, the management plan for which references WAC. Santos has consulted with WAC.
Yamatji Marlpa Aboriginal Council (YMAC)	YMAC is the Native Title Representative Body (NTRB) that facilitates native claims on behalf of First Nations people and groups, as well as acting in the interests of Native Title Prescribed Body Corporates where directed by Corporation Directors. YMAC is the NTRB for the Pilbara region. The EMBA intersects the Ningaloo, Gascoyne, Dampier, and Montebello Marine Parks, the management plan for which references YMAC. Santos has consulted with YMAC.
Industry Associations – Commercial Fishing	
Australian Southern Bluefin Tuna Industry Association (ASBTIA)	ASBTIA represents the interests of commercial fishers in the Southern Bluefin Tuna Fishery and Western Skipjack Fishery.
Commonwealth Fisheries Association (CFA)	CFA represents the interests of commercial fishers with licences in Commonwealth waters.
Tuna Australia (TA)	TA represents the interests of the Western Tuna and Billfish Fishery
Western Australian Fishing Industry Council (WAFIC)	WAFIC represents the interests of the WA commercial fishing, pearling and aquaculture sector.
Western Rock Lobster (WRL)	Western Rock Lobster (WRL) is the peak industry body representing the interests of the western rock lobster commercial fishing industry.

Relevant person category	Summary of relevance
Industry associations – Community	
Exmouth CLG	The Exmouth CLG convenes three times a year in Exmouth, in collaboration with neighbouring oil and gas operators. The membership of this group is diverse and currently includes about 40 community representatives. Santos consults with the CLG as part of informing good environmental management practices.
Industry associations – Local industry	
Exmouth Chamber of Commerce and Industry	Regional representative organisation representing the interests of local business.
Karratha and Districts Chamber of Commerce and Industry	Regional representative organisation representing the interests of local business.
Onslow Chamber of Commerce and Industry	Regional representative organisation representing the interests of local business.
Industry Associations – Energy	
Australian Energy Producers	AEP represents the interests of oil and gas explorers and producers in Australia.
Industry Associations – Tourism	
Recfishwest	Recfishwest represents the interests of Western Australia's recreational fishing sector.
Marine Tourism WA (MTWA)	The MTWA is an association made up of charter industry owners and operators.
Tourism Council of Western Australia	Tourism Council WA is the peak body representing tourism businesses, industries and regions in Western Australia.
WA Game Fishing Association (WAGFA)	WAGFA co-ordinates the activities of game fishing throughout Western Australia, maintains State game fishing records and data concerning open game fishing tournaments of its member clubs. WAGFA members are: • Broome Fishing Club • Cockburn Power Boats • Exmouth Game Fishing Club • Fremantle Sailing Club • Geraldton and District Offshore Fishing Club • King Bay Gamefishing Club • Marmion Angling and Aquatic Club • Naturaliste Game and Sports Fishing Club • Nor-West Game Fishing Club • Perth Game Fishing Club
Western Australian Indigenous Tourism Operators Council (WAITOC)	WAITOC is the peak representative for Aboriginal tours and experiences in Western Australia.
Infrastructure operators	
Vocus	Owner and operator of an offshore fibre network intersecting the EMBA.

Relevant person category	Summary of relevance
Local Government Authorities	
Port of Dampier	The Port of Dampier is located near Karratha and predominantly used for the export of iron ore, LNG, salt and condensate.
Port of Onslow	The Port of Onslow is a multi-user port located in Onslow on the West Australian coast and predominantly used for commodity exports, supply base services and recreation.
Shire of Ashburton	The Shire of Ashburton is a local government area in the Pilbara region of Western Australia.
City of Karratha	The City of Karratha is a local government area in the Pilbara region of Western Australia.
Shire of Exmouth	The Shire of Exmouth is a local government area in the Gascoyne region of Western Australia.
Tourism Operators – Dive	
3 Islands Whale Shark Dive (Exmouth)	Marine tourism operator active within the EMBA.
Aussie Marine Adventures (Exmouth & Coral Bay)	Marine tourism operator active within the EMBA.
Coral Bay Eco Tours (Coral Bay)	Marine tourism operator active within the EMBA.
Dive Ningaloo (Exmouth)	Marine tourism operator active within the EMBA.
Exmouth Dive & Whalesharks (Exmouth)	Marine tourism operator active within the EMBA.
Exmouth Diving Centre (Exmouth)	Marine tourism operator active within the EMBA.
Kings Ningaloo Reef tours (Exmouth)	Marine tourism operator active within the EMBA.
Monte Bello Island Safaries (Exmouth)	Marine tourism operator active within the EMBA.
Ningaloo Blue Dive (Exmouth)	Marine tourism operator active within the EMBA.
Ningaloo Discovery (Exmouth)	Marine tourism operator active within the EMBA.
Ningaloo Reef Dive (Exmouth)	Marine tourism operator active within the EMBA.
Ningaloo Whaleshark Dive (Exmouth)	Marine tourism operator active within the EMBA.
Ningaloo Whalesharks (Exmouth)	Marine tourism operator active within the EMBA
Ocean Eco Adventures (Exmouth)	Marine tourism operator active within the EMBA.
View Ningaloo (Exmouth)	Marine tourism operator active within the EMBA.
Tourism Operators – Charter operators	
Aquatic Adventures	Marine tourism operator active within the EMBA.
Blue Horizon Charters	Marine tourism operator active within the EMBA.
Elite Charters	Marine tourism operator active within the EMBA.
Evolution Charters Exmouth	Marine tourism operator active within the EMBA.

Relevant person category	Summary of relevance
Exmouth Boat Hire	Marine tourism operator active within the EMBA.
Exmouth Fishing Adventures	Marine tourism operator active within the EMBA.
Fawesome Expeditions Exmouth	Marine tourism operator active within the EMBA.
Mackerel Islands Fishing Charters	Marine tourism operator active within the EMBA.
Mahi Mahi Fishing Charters	Marine tourism operator active within the EMBA.
Ningaloo Sportfishing Charters	Marine tourism operator active within the EMBA.
Onslow Bay Boatworks	Marine tourism operator active within the EMBA.
On Strike Charters Exmouth	Marine tourism operator active within the EMBA.
Peak Sportfishing Adventures	Marine tourism operator active within the EMBA.
Seaestar Boat Charters	Marine tourism operator active within the EMBA.
Seaforce Charters	Marine tourism operator active within the EMBA.
Top Gun Charters	Marine tourism operator active within the EMBA.

4.5.6 Provision of Sufficient Information

Santos provided relevant persons with sufficient information so they can make an informed assessment about the possible consequences of the Activity on their functions, interests or activities. Santos provided relevant persons with information regarding:

- The Activity proposed under this EP
- The environment that may be affected by the Activity, including depictions of the modelled EMBA and explaining how the EMBA is determined
- The potential environmental impacts and risks of the Activity and proposed control measures
- The environmental approval process
- The purpose of consultation, who may be a relevant person and how to self-nominate as a potential relevant person
- The titleholder’s obligations during consultation in the course of preparing an environment plan, including the obligation of the titleholder not to publish particular information if so requested by the relevant person
- How to provide feedback.

Relevant persons were provided access to information using different mediums and platforms, including by telephone, email, website (https://www.santos.com/) hard copy and electronic materials and social media.

At a minimum, this information was available on the Santos website and also included in the fact sheets which Santos sent to relevant persons by email or made available during consultation sessions.

Santos also disseminated and promoted the NOPSEMA community information brochure, *Consultation on offshore petroleum environment plans*. This brochure contains information for community members to better understand the responsibilities of titleholders to consult relevant persons in the development of environment plans, the purpose of consultation and how relevant persons can provide feedback.

4.5.7 Consultation Approach

In developing this EP Santos has made itself available to work with authorities, persons and organisations on pragmatic and practical approaches to section 25 consultation.

In its preliminary consultation emails, Santos invited feedback on appropriate consultation methods and information needs. Santos also sought information as to functions, interests or activities that may be affected by the activity.

This approach has included:

- Providing relevant persons access to information using different mediums and platforms, including by telephone, email, website, electronic materials, in person and virtual meetings.
- Making information about the proposed activities to be managed under this EP available on the Santos website at www.santos.com/offshoreconsultation. Provision of hyperlinks to this website were included in consultation emails.

Santos’ activity-centric approach has been applied to consultation with respect to commercial and recreational fishing, given the significant geographic extent of some of commercial fisheries and the location of historical catch and effort by commercial and recreational fishers relative to the proposed petroleum activity. This approach considers:

- Developing a fact sheet specific to the information needs of the commercial fishing sector.
- Recognising WAFIC’s published guidance that petroleum titleholders consult directly with those Western Australian fishery licence holders that have been historically active in Operational Areas, while providing a list of all entitled fisheries that overlap the EMBA. This approach acknowledges previous feedback from WAFIC regarding consultation fatigue among WA’s estimated 1500 fishing boat licence holders.
- Using a WAFIC fee-for-service arrangement to circulate Santos' consultation information via email to licence holders and making information available to potentially affected commercial fishing licence holders.
- Recognising previous feedback from Recfishwest that petroleum titleholders consult directly with those fishing clubs with regional proximity to Operational Areas, while providing information on activity EMBAs that may have broader implications for recreational fishers. This approach acknowledges DPIRD's estimated 620,000 recreational fishers in WA.

All authorities, persons and organisations engaged during the preliminary consultation and consultation phases were provided a link to the NOPSEMA brochure: Consultation on offshore petroleum environment plans.

Additional details Santos consultation approach with First Nation people is set out in Section 4.5.4.

A schedule of consultation activities is included at Table 4-7 and a schedule of advertising is included at Table 4-8.

4.5.8 Reasonable Period for Consultation

Santos is required to allow a relevant person a reasonable period for consultation.

Santos provided ~60 days for feedback to be provided, from the start of preliminary consultation information being provided, to review and respond with feedback about the proposed activities (unless there was a reason for understanding sooner that the person or organisation did not require further consultation).

Santos directly contacted relevant persons notifying them of the consultation process and consultation period, confirming the date by which feedback was sought and outlining how feedback may be provided.

4.5.9 Consultation Opportunities

Santos offered multiple avenues and mediums for consultation, including:

- Response by return email
- Provision of a toll free 1800 number
- In-person or virtual meetings, as appropriate.

Following initial correspondence and/or in person conversations, attempts were made to follow up where no response was received.

Table 4-7: Summary of Consultation Activities

Activity	Purpose	Timing
Preliminary Consultation 30 May- 28 June 2024		
Website Website content and activity fact sheets developed and made available at https://www.santos.com/offshoreconsultation/carnarvon/	**Provide:** • Information about Santos' consultation obligations and approach. • Descriptions of proposed activities, including potential activity impacts and risks, and proposed management measures. • Contact information to enable relevant persons to provide feedback. • Information about how to self-identify as a relevant person, including an online nomination form. • Details about how feedback will be managed, including provision of Santos' offshore Western Australia	From 30 May 2024
Advertising Advertisements in the following publications: • The West Australian • Midwest Times • North West Telegraph • Pilbara News Guardian Advertisements on the following radio stations: • Karratha HIT 106.5 • WA Remote HIT WA FM • Pilbara and Kimberley Aboriginal Media Radio	Promote awareness of proposed activities to create opportunities for relevant persons to self-identify and seek feedback from relevant persons in addition to those identified by Santos as part of its initial public review process.	From 30 May 2024
Consultation materials • Email to identified relevant persons with a link to the fact sheet for this EP		From 30 May2024

Activity	Purpose	Timing
Consultation 28 June to 29 July 2024		
Consultation materials Email to identified relevant persons advising the commencement of consultation	Reminder to Santos identified relevant persons of the commencement and closing dates for consultation.	From 30 May 2024
Advertising Advertisements in the following publications: • The West Australian • Midwest Times • North West Telegraph • Pilbara News Guardian Advertisements on the following radio stations: • Karratha HIT 106.5 • WA Remote HIT WA FM • Pilbara and Kimberley Aboriginal Media Radio	Promote awareness of proposed activities and seek feedback from relevant persons	From 30 May 2024
Consultation email • Reminder email to identified relevant persons advising pending closure of consultation period	Reminder to Santos identified relevant persons of the closing dates for consultation	From 30 May 2024

Table 4-8: Consultation advertising (30 May- 29 July 2024)

Publication date	Advertising type	Towns / Communities	Reach
Preliminary consultation 30 May- 28 June 2024			
30 May–28 June 2024	Social Media notice	Facebook, Instagram and Messenger	Geotargeted PPL18+ Pilbara and Exmouth
30 May–28 June 2024	Radio Ad – Karratha HIT 106.5	Karratha towns and communities, focusing on remote communities	N/A
30 May–28 June 2024	Radio Ad – WA Remote HIT WA FM	WA remote towns and communities	N/A
30 May–28 June 2024	Radio Ad – Pilbara and Kimberley Aboriginal Media Radio	Pilbara and Kimberley towns and communities, focusing on remote communities	N/A
3 June 2024	Press Ad Western Australian	Half page, page 11	Targeted WA with reach of 359,000
19 June 2024	Press Ad North West Telegraph	Half page, page 6	Targeted WA with reach of 8,154
19 June 2024	Press Ad Midwest Times	Half page, page 9	Targeted WA with reach of 50,534
19 June 2024	Press Ad Pilbara News Guardian	Half page, page 11	Targeted WA with reach of 17,611
Consultation 28 June to 29 July 2024			
28 June to 29 July 2024	Social Media notice	Facebook, Instagram and Messenger	Geotargeted PPL18+ Pilbara and Exmouth

Publication date	Advertising type	Towns / Communities	Reach
28 June to 29 July 2024	Radio Ad – Karratha HIT 106.5	Karratha towns and communities, focusing on remote communities	N/A
28 June to 29 July 2024	Radio Ad – WA Remote HIT WA FM	WA remote towns and communities	N/A
28 June to 29 July 2024	Radio Ad – Pilbara and Kimberley Aboriginal Media Radio	Pilbara and Kimberley towns and communities, focusing on remote communities	N/A
1 July 2024	Press Ad Western Australian	Half page, page 11	Targeted WA with reach of 359,000
17 July 2024	Press Ad North West Telegraph	Half page, page 4	Targeted WA with reach of 8,154
17 July 2024	Press Ad Midwest Times	Half page, page 11	Targeted WA with reach of 50,534
17 July 2024	Press Ad Pilbara News Guardian	Half page, page 6	Targeted WA with reach of 17,611

4.6 Consultation Report

A summary report including the outcomes of consultation with relevant persons, including any objections or claims and Santos' assessment of them, satisfying the requirements of section 24(b)(i)-(iii) of the OPGGS(E)R, is provided in Appendix F. The full records of relevant persons consultation, as required by section 24(b)(iv) of the OPGGS(E)R, is provided in the **Sensitive Information Report**.

Where objections or claims made during consultation were considered relevant to this EP, sections within this EP and the OPEP have been referenced within the consultation report (Table 4-9) for each objection or claim, showing where existing information relevant to that objection or claim is located. Where additional information or measures have been added to this EP or the OPEP (EA-14-RI-10001.02) resulting from the consultation process, references to relevant sections have also been made.

Santos is committed to appropriate consultation post-acceptance of this EP with relevant government authorities and other relevant interested persons and organisations.

Having regard to the nature of relevant interested persons and organisations, Santos' post acceptance consultation implementation strategy has been tailored to provide for effective consultation with different groups, based on Santos' experience consulting with these groups previously.

Section 8.13 describes the Santos' post-acceptance consultation implementation strategy.

Table 4-9:Consultation Summary Report

Section 25(1)(a): Departments or agencies of the Commonwealth to which the activities to be carried out under the environment plan may be relevant

Australian Border Force (ABF) Maritime Border Command

- On 30 May 2024 Santos emailed ABF regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4629]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed ABF to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4883]
- On 19 July 2024 Santos emailed ABF by way of reminder that the consultation is closing on the 29 July 2024. [Con-5143]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from ABF.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from ABF.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required	Not applicable.

Australian Fisheries Management Authority (AFMA)			
• On 8 July 2024 Santos emailed AFMA regarding consultation on the proposed activities to be managed under this EP, advising that consultation had commenced and would close on 7 August 2024. [Con-5091] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 9 July 2024 AFMA emailed Santos and advised it has no comments on the proposal and noted Santos had contacted relevant industry associations for comment. [Con-5090] • On 11 July 2024 Santos emailed AFMA acknowledging and thanking it for its response. [Con-5093]			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
AFMA did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates. Santos also notes standard advice previously provided by AFMA with respect to activity notifications.	No response required.	Section 3.2.7.1 Notifications to AFMA are included in Table 8-4.
Australian Hydrographic Office (AHO)			
• On 30 May 2024 Santos emailed Australian Hydrographic Office (AHO) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4627] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information • On 31 May 2024 Australian Hydrographic Office (AHO) responded to Santos with an automatic reply acknowledging the email. [Con-4691] • On 28 June 2024 Santos emailed Australian Hydrographic Office (AHO) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4882] • On 19 July 2024 Santos emailed Australian Hydrographic Office by way of reminder that the consultation is closing on the 29 July 2024. [Con-5144] No further correspondence or feedback was received from AHO. In the absence of any specific response, Santos has reverted to standard advice provided by AHO and AMSA with respect to maritime safety matters. Santos has considered and applied this standard advice to this EP, including activity notifications.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from AHO.	No objection or claim raised about the adverse impact of each activity to which this EP relates. Santos also notes standard advice previously provided by AHO with respect to activity notifications.	No response required.	Notifications to AHO are included in Table 8-4.

	Santos will include all formal notification requirements in the relevant sections of this EP, specifically the following: • Requirement to notify the AHO through datacentre@hydro.gov.au no less than 4 working weeks before operations commence for the promulgation of related notices to mariners. Requirement to notify AMSA and AHO on any changes to the intended operations.		
Australian Institute of Marine Science (AIMS)			
• On 30 May 2024 Santos emailed AIMS regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4628] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed AIMS to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4860] • On 19 July 2024 Santos emailed AIMS by way of reminder that the consultation is closing on 29 July 2024. [Con-5146] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from AIMS.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from AIMS.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required	Not applicable.
Australian Maritime Safety Authority (AMSA) – Maritime Safety			
• On 30 May 2024 Santos emailed AMSA– Maritime Safety regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4625] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.			

- On 28 June 2024 Santos emailed AMSA – Maritime Safety to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4881]
- On 19 July 2024 Santos emailed AMSA – Maritime Safety by way of reminder that the consultation is closing on 29 July 2024. [Con-5147]
- On 23 July 2024, AMSA emailed Santos and provided information regarding marine traffic in the activity area, and charted shipping fairways within the EMBA. AMSA outlined various notification and vessel safety measures and requirements. A second email from AMSA that same day advised the email sent earlier that day should not have indicated a 'Draft' status[Con-5182]
- On 5 August 2024 Santos emailed AMSA in response to feedback received on 23 July 2024. [Con-5260]

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
AMSA requested Santos to notify AMSA's Joint Rescue Coordination Centre (JRCC) for promulgation of radio-navigation warnings 24-48 hours before operations commence and provided AMSA JRCC's communications expectations.	Santos notes feedback from AMSA and will provide notifications requested. .	Santos will notify AMSA's Joint Rescue Coordination Centre (JRCC for promulgation of radio-navigation warnings 24-48 hours before operations commence.	JRCC notifications are included in Table 8-4: Activity notification and reporting requirements.
AMSA requested Santos to contact the Australian Hydrographic Office no less than four working weeks before operations commence for related notices to mariners.	Santos notes feedback from AMSA and will provide notifications requested. .	Santos will contact the Australian Hydrographic Office no less than four working weeks before operations commence.	Australian Hydrographic Office notifications are included in Table 8-4: Activity notification and reporting requirements.
AMSA advised that vessels should exhibit appropriate lights and shapes to reflect the nature of operations, noting Santos' obligation to comply with the International Rules for Preventing Collisions at Sea (COLREGs), in particular, the use of appropriate lights and shapes. AMSA requested that vessels also ensure their navigation status was set correctly in the ship's AIS unit.	Santos notes feedback from AMSA and will comply with the COLREGs. .	Santos will ensure vessels exhibit appropriate lights and shapes to reflect the nature of operations – we are aware of the obligation to comply with the International Rules for Preventing Collisions at Sea (COLREGs), in particular, the use of appropriate lights and shapes to reflect the nature of operations (e.g. restricted in the ability to man oeuvre). Vessels will also ensure navigation status is set correctly in the ship's AIS unit.	Lighting and navigation controls are included in: EPS reference number RE_CM-05-EPS-02.
AMSA advised that Santos should evaluate and implement adequate anti-collision measures, noting that collision risk mitigation measures may include: additional warnings and/or lights; offshore guard vessel/s.	Santos notes feedback from AMSA and will include anti-collision measures. .	Santos will review and assess the merit of the proposed mitigation strategies and anti-collision measures as per our standard approach to all vessel activities.	Additional anti-collision measures are considered in Table 7-15.Control measures evaluation for release of hydrocarbons.

Australian Maritime Safety Authority (AMSA) – Marine Pollution

- On 30 May 2024 Santos emailed AMSA– Marine Pollution regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4626]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed AMSA – Marine Pollution to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4879]
- On 19 July 2024 Santos emailed AMSA – marine pollution by way of reminder that the consultation is closing on 29 July 2024. [Con-5148]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from AMSA – Marine Pollution.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from AMSA – Marine Pollution.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Department of Agriculture, Forestry and Fisheries (DAFF) – Biosecurity (marine pests)

- On 30 May 2024 Santos emailed DAFF – Biosecurity (Marine Pests) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4624]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 30 May 2024 an auto response was received from DAFF – Biosecurity advising they would attend to the enquiry within 10 business days. [Con-4690]
- On 28 June 2024 Santos emailed DAFF – Biosecurity to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4877]
- On 28 June 2024 an auto response was received from DAFF – Biosecurity advising they would attend to the enquiry within 10 business days.. [Con-5089]
- On 19 July 2024 Santos emailed DAFF – Biosecurity by way of reminder that the consultation is closing on the 29 July 2024. [Con-5277]
- On 19 July 2024 an auto response was received from DAFF – Biosecurity advising they would attend to the enquiry within 10 business days. [Con-5185]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DAFF – Biosecurity.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DAFF – Biosecurity.	Santos considers it has provided sufficient information and a reasonable period of time for consultation.	No response required.	Santos' environmental management framework relevant to biosecurity risk is outlined in Section 7.1 is consistent with DAFF requirements.

	Santos considers Section 25 consultation requirements to have been met.		
Department of Agriculture, Forestry and Fisheries (DAFF) –Fisheries			
• On 8 July 2024 Santos emailed DAFF – Fisheries regarding consultation on the proposed activities to be managed under this EP, advising that consultation had commenced and would close on 7 August 2024. [Con-5091] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 11 July 2024 DAFF Fisheries emailed Santos and advised that its comments are in line with those from AFMA, with nothing further from DAFF. [Con-5092] • On 11 July 2024 Santos emailed DAFF acknowledging and thanking it for its response. [Con-5093] No further correspondence or feedback was received from DAFF - Fisheries.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
DAFF – Fisheries confirmed that it did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates. Santos also notes standard advice previously provided by DAFF – Fisheries with respect to activity notifications.	Santos thanked DAFF – fisheries for its response.	Notifications to DAFF – Fisheries are included in Table 8-4. Section 3.2.7.1 (Commercial fisheries).
Department of Climate Change, Energy, the Environment and Water (DCCEEW) – Underwater Cultural Heritage (UCH)			
• On 30 May 2024 Santos emailed DCCEEW– Underwater Cultural Heritage regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4623] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed DCCEEW– Underwater Cultural Heritage to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4876] • On 19 July 2024 Santos emailed DCCEEW – Underwater Cultural Heritage by way of reminder that the consultation is closing on 29 July 2024. [Con-5149] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DCCEEW (UCH).			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DCCEEW (UCH).	In the absence of any specific response, Santos has reverted to standard advice provided by DCCEEW	No response required.	Section 3.2.7.7 (cultural features)

	with respect to underwater cultural heritage matters. Santos has considered and applied this standard advice to this EP, including activity notifications. Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.		Notifications to DCCEEW (UCH) are included in Table 8-4.

Department of Defence (DoD)

- On 30 May 2024 Santos emailed DoD regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4620]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed DoD to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4875]
- On 19 July 2024 Santos emailed DoD by way of reminder that the consultation is closing on the 29 July 2024. [Con-5150]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DoD.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DoD.	In the absence of any specific response, Santos has reverted to standard advice provided by DoD with respect to defence matters. Santos has considered and applied this standard advice to this EP, including activity notifications. Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Section 3.2.7.6 (defence) Notifications to DoD are included in Table 8-4

Department of Industry, Science and Resources (DISR)

- On 30 May 2024 Santos emailed DISR regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4622]

- The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
- The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

- On 28 June 2024 Santos emailed DISR to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4874]
- On 19 July 2024 Santos emailed DISR by way of reminder that the consultation is closing on the 29 July 2024. [Con-5151]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DISR.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DISR.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Director of National Parks (DNP)

- On 30 May 2024 Santos emailed DNP regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4619]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed DNP to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4873]
- On 11 July 2024 DNP emailed Santos to thank it for providing an opportunity to comment. DNP advised that based on the information provided, the planned activity does not overlap any Australian Marine Parks and there are no authorisation requirements from the DNP. DNP confirmed that it does not require further notification of progress made in relation to this activity unless details regarding the activity change and result in an overlap with a marine park or new impact, or for emergency responses. [Con-5094]
- On 14 August 2024 Santos responded to DNPs letter of 11 July noting their response that the planned activity does not overlap any Australian Marine Parks and there are no authorisation requirements from the Director of National Parks. DNP confirmed that it does not require further notification of progress made in relation to this activity unless details regarding the activity change and result in an overlap with a marine park or new impact, or for emergency responses. [Con-5480]

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
DNP advised that the planned activity does not overlap any Australian Marine Parks and there are no authorisation requirements from the Director of National Parks (DNP).	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	Santos responded noting that the activity does not overlap any Australian Marine Parks and there are no authorisation requirements from the Director of National Parks	Section 3.2.5.1 (Australian Marine Parks and State Marine Parks, Management Areas and Reserves).
DNP confirmed that it does not require any further notification of progress in	This response does not raise an objection or claim about the adverse	No response required.	Section 3.2.5.1 (Australian Marine Parks and State Marine Parks, Management Areas and Reserves).

relation to this activity unless activity details change and result in overlap with a marine park or new impact or emergency response	impact of each activity to which this EP relates.		Santos will notify DNP in the event oil/gas pollution incident as required (Table 8-4).

Regulation 25A(1)(a): Departments or agencies of Western Australia to which the activities to be carried out under the environment plan may be relevant

Department of Biodiversity, Conservation and Attractions (DBCA)

- On 30 May 2024 Santos emailed DBCA) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4640]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 30 May 2024, an auto response was received from DBCA advising that a reply would be sent as soon as possible. [Con-4685]
- On 28 June 2024 Santos emailed DBCA to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4892]
- On 16 July 2024, DBCA emailed Santos to advise it had undertaken a review of the documentation provided and other readily available information, and provided comments on matters relevant to the Conservation and Land Management Act 1984 (CALM Act) and the Biodiversity Conservation Act 2016 (BC Act) related responsibilities [Con-5095].
- On 5 August 2024 Santos emailed DBCA in response to feedback received on 16 July 2024. [Con-5264]

No further correspondence or feedback was received from DCBA.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
DBCA noted the need for baseline monitoring of receptors given the proximity of activities to the Dampier Archipelago Reserve System (R 36913 and R 36915), island of the Great Sandy Island Nature Reserve System (R 33831) and the Montebello Islands Marine Park (M 9),	Santos acknowledges that there are ecologically important areas located in the vicinity of the proposed activities, and within the wider EMBA.	Santos responded that: Values and sensitivities of marine parks would be documented in Section 3 (Existing Environment Description) of the EP which provides the state of environment to inform the risk and impacts of the proposed activities. Santos baseline data was reviewed every two years. In areas where limited baseline data was available, post spill pre-impact monitoring for the relevant receptors would be carried out in line with Santos' Operational and Scientific Monitoring Plan (OSMP). The potential area that could be affected by an unplanned hydrocarbon release were risk and impact assessed and would be documented in Section 7 of this EP, with appropriate measures	Section 3.2.5.1 (Australian Marine Parks and State Marine Parks, Management Areas and Reserves). Sections 7.6 (Surface release of condensate from the WHP), 7.7 (Subsea release of condensate from DC supply pipeline) and 7.8 (Surface

			applied to reduce the potential risk and impacts to ALARP and acceptable levels.	release of diesel)
DBCA welcomed additional information in relation to its monitoring of receptors or oil spill response preparedness for proposed activities.	Santos acknowledges DBCA’s request for further information.		Santos responded that there was no further information to provide in relation to monitoring of receptors or oil spill responses preparedness for proposed activities.	Not applicable
DBCA recommended that Santos undertake early consultation with DBCA should any activities require access to reserves managed by DBCA or requiring the taking / disturbance of threatened fauna listed under the BC Act in State waters.	Santos notes feedback provided by DBCA.		Santos responded that it would engage with DBCA to obtain appropriate permissions should any activities require access to reserves managed by DBCA or requiring the taking / disturbance of threatened fauna listed under the BC Act in State waters.	Devil Creek Pipeline and Reindeer WHP OPEP
DBCA requested that Santos notify DBCA’s Karratha office in the event of a hydrocarbon release.	Santos notes feedback from DBCA.	No response required.	Notifications to DBCA are included in Table 8-4	
Department of Planning, Lands and Heritage (DPLH)				
• On 30 May 2024 Santos emailed DPLH regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4641] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed DPLH to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4890] • On 19 July 2024 Santos emailed DPLH by way of reminder that the consultation is closing on the 29 July 2024. [Con-5155] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DPLH.				
Summary of response by relevant person	***Assessment of merits***		***Santos’ response statement***	***EP reference***
No response was received from DPLH.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.		No response required.	Section 3.2.7.7 (cultural features)
Department of Primary Industries and Regional Development (DPIRD)				
• On 8 July 2024 Santos emailed DPIRD regarding consultation on the proposed activities to be managed under this EP, advising that consultation has commenced and will conclude on 7 August 2024. [Con-5101]. – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.				

– The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 7 August 2024 Santos emailed DPIRD by way of reminder that the consultation is closing on the 14 August 2024, a week later than earlier advised as a follow up email had not been sent. [Con-5305] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DPIRD.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DPIRD.	In the absence of any specific response, Santos has reverted to standard advice provided by DPIRD with respect to commercial fishing matters. Santos has considered and applied this standard advice to this EP, including activity notifications. Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Notifications to DPIRD are included in Table 8-4
Department of Transport (DoT) – Marine Pollution			
• On 30 May 2024 Santos emailed DoT – Marine Pollution regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4638] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 30 May 2024 DoT– Marine Pollution responded to Santos with an automatic reply with thanks for the email. [Con-4687] • On 28 June 2024 Santos emailed DoT – Marine Pollution to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4889] • On 8 July 2024 DoT responded to Santos asking to be consulted if there is a risk of spill impacting state waters from the proposed activities as outlined in its Offshore Petroleum Industry Guidance Note – Marine Oil Pollution: Response and Consultation Arrangements (July 2020). [Con-5102] • On 19 August 2024 Santos emailed DoT WA and attached a copy of the draft Devil Creek Pipeline and Reindeer WHP OPEP indicating it would be submitted with the EP in due course.[Con-5483]			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
DoT responded by requesting consultation if there is a risk of spill impacting State water from the proposed activities.	Santos notes feedback provided by DoT.	Santos responded by sending DoT a copy of the draft Devil Creek Pipeline and Reindeer WHP OPEP for review. Santos also informed DoT that the Devil Creek Pipeline and Reindeer WHP OPEP will be submitted with the EP in due course.	Notifications to DoT are included in Table 8-4

Department of Jobs, Tourism, Science and Innovation (JTSI)			
• On 30 May 2024 Santos emailed JTSI regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4642] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed JTSI to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4893] • On 19 July 2024, Santos emailed JTSI by way of reminder that the consultation is closing on the 29 July 2024. [Con-5152] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from JTSI.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from JTSI.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Ningaloo Coast World Heritage Advisory Committee (NCWHAC)			
• On 30 May 2024 Santos emailed NCWHAC regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4634] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed NCWHAC to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4888] • On 19 July 2024, Santos emailed NCWHAC by way of reminder that the consultation is closing on the 29 July 2024. [Con-5157] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from NCWHAC.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from NCWHAC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Pilbara Development Commission (PDC)			
• On 30 May 2024 Santos emailed PDC regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4637] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.			

- – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed PDC to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4885]
- On 19 July 2024, Santos emailed PDC by way of reminder that the consultation is closing on the 29 July 2024. [Con-5159]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from PDC.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from PDC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Western Australian Museum (WAM)

- On 30 May 2024 Santos emailed WAM regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4639]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed WAM to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4886]
- On 19 July 2024 Santos emailed WAM by way of reminder that the consultation is closing on the 29 July 2024. [Con-5158]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from WAM.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from WAM.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Notifications to WAM are included in Table 8-4

Regulation 25(1)(b): Department of the responsible Western Australian Minister

WA Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)

- On 30 May 2024 Santos emailed DEMIRS regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4633]
  - The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed DEMIRS to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4884]

• On 19 July 2024 Santos emailed DEMIRS by way of reminder that the consultation is closing on the 29 July 2024. [Con-5160] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from DEMIRS			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from DEMIRS.	In the absence of any specific response, Santos has reverted to standard advice provided by DEMIRS with respect to activities that have implications for WA managed lands and waters. Santos has considered and applied this standard advice to this EP, including activity notifications. Santos will include all formal notification requirements in the relevant sections of this EP, specifically the following: • Santos will notify DEMIRS four weeks prior to the start and upon activity completion.	No response required.	Notifications to DEMIRS are included in Table 8-4.
Regulation 25(1)(d): Persons or organisations whose functions, interests or activities may be affected by the activities to be carried out under the environment plan, or the revision of the environment plan			
Commercial fishing – Commonwealth managed			
North West Slope Trawl Fishery			
Consulted via AFMA nominated contact organisation – Commonwealth Fisheries Association.			
Southern Bluefin Tuna Fishery			
Consulted via AFMA nominated contact organisation – Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association.			
Western Deepwater Trawl Fishery			
Consulted via AFMA nominated contact organisation – Commonwealth Fisheries Association.			
Western Skipjack Tuna Fishery			
Consulted via AFMA nominated contact organisation – Australian Southern Bluefin Tuna Industry Association, Commonwealth Fisheries Association.			
Western Tuna and Billfish Fishery			
Consulted via AFMA nominated contact organisation – Tuna Australia			
Commercial fishing – Western Australian managed			
Mackerel Managed Fishery; Marine Aquarium Managed Fishery; Pilbara Fish Trawl Managed Fishery			
Consulted via representative organisation – Western Australian Fishing Industry Council (WAFIC)			
Energy industry – Petroleum titleholders and GHG permit holders			
Beagle No. 1 P/L (Beagle)			
• On 30 May 2024 Santos emailed Beagle regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4609]			

– The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Beagle to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4689] • On 19 July 2024, Santos emailed Beagle No. P/L by way of reminder that the consultation is closing on the 29 July 2024. [Con-5172] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Beagle No. 1 P/L.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Beagle	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Carnarvon Energy			
• On 30 May 2024 Santos emailed Carnarvon Energy regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4608] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 13 June 2024, Carnarvon Energy responded to Santos and advised that there were no comments to add to the proposal. [Con-4696] • On 19 July 2024 Santos emailed Carnarvon Energy Santos emailed Carnarvon Energy to acknowledge their email of 13 June advising Santos they had no comments on the activity described in the EP. [Con-5239] No further correspondence or feedback was received from Carnarvon Energy Ltd.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
Carnarvon Energy responded that it did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.
Chevron Australia P/L			
• On 30 May 2024 Santos emailed Chevron Australia P/L regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4616] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Chevron Australia P/L to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4868]			

• On 19 July 2024, Santos emailed Chevron by way of reminder that the consultation is closing on the 29 July 2024. [Con-5173] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Chevron Australia.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Chevron Australia	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Coastal Oil & Gas P/L			
• On 30 May 2024 Santos emailed Coastal Oil & Gas regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4615] – The email included an activity summary with a link to a fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Coastal Oil & Gas to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4867] • On 19 July 2024, Santos emailed Coastal Oil and Gas by way of reminder that the consultation is closing on the 29 July 2024. [Con-5174] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Coastal Oil & Gas P/L.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Coastal Oil & Gas P/L	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Eni Australia Ltd			
• On 30 May 2024 Santos emailed Eni Australia Ltd regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4607] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 11 June 2024 Eni Australia Ltd responded to Santos with no concerns regarding the activity. [Con-4695] • On 19 July 2024 Santos emailed Eni Australia to acknowledge their email of 11 June advising Santos they had no comments about the activity described in the EP [Con-5240] No further correspondence or feedback was received from Eni Australia.			

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
Eni Australia responded that it did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.

Finder Energy

- On 30 May 2024 Santos emailed Finder Energy regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4606]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 4 June 2024, Finder Energy responded to Santos with no comment or objections to the EP. [Con-4694]
- On 19 July 2024 Santos emailed Finder Energy to acknowledge their email of 4 June advising Santos that it had no comments regarding this EP. [Con-5238]

No further correspondence or feedback was received from Finder Energy.

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
Finder Energy responded that it did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.

Jadestone Energy (Australia)

- On 30 May 2024 Santos emailed Jadestone Energy regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4613]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 24 June 2024 Jadestone Energy responded to Santos with no further comments regarding this EP. [Con-4697]
- On 19 July 2024 Santos emailed Jadestone Energy to acknowledge their email of 24 June advising Santos. [Con-5237]

No further correspondence or feedback was received from Jadestone Energy.

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
Jadestone Energy responded that it did not have any comments in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.

KATO Energy (WA) P/L			
• On 30 May 2024 Santos emailed KATO Energy regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4605] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed KATO Energy to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4865] • On 19 July 2024 Santos emailed KATO Energy by way of reminder that the consultation is closing on the 29 July 2024. [Con-5176] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from KATO Energy (WA) P/L.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from KATO Energy (WA) P/L	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Mobil Australia Resources Company P/L (Mobil)			
• On 30 May 2024 Santos emailed Mobil regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4604] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Mobil to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4864] • On 19 July 2024 Santos emailed Mobil by way of reminder that the consultation is closing on the 29 July 2024. [Con-5177] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Mobil.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Mobil Australia.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Skye Resources P/L			
• On 30 May 2024 Santos emailed Skye Resources regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4602] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.			

– The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Skye Resources to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4863] • On 19 July 2024, Santos emailed Skye Resources by way of reminder that the consultation is closing on the 29 July 2024. [Con-5178] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Skye Resources P/L.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Skye Resources P/L.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Vermillion O&G Australia (Vermillion)			
• On 30 May 2024 Santos emailed Vermillion regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4614] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Vermillion to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4862] • On 19 July 2024 Santos emailed Vermillion by way of reminder that the consultation is closing on the 29 July 2024. [Con-5179] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Vermillion O&G Australia.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Vermillion O&G Australia.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Woodside Energy Ltd			
• On 30 May 2024 Santos emailed Woodside regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4612] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Woodside to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4861] • On 19 July 2024, Santos emailed Woodside by way of reminder that the consultation is closing on the 29 July 2024. [Con-5180]			

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Woodside Energy Ltd.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Woodside Energy Ltd.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Environmental Conservation

Cape Conservation Group (CCG)

- On 30 May 2024 Santos emailed CCG regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4618]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed CCG to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4872]
- On 19 July 2024 Santos emailed CCG by way of reminder that the consultation is closing on the 29 July 2024. [Con-5183]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Cape Conservation Group.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Cape Conservation Group.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Protect Ningaloo

- On 30 May 2024 Santos emailed Protect Ningaloo regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4617]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Protect Ningaloo to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4871]
- On 19 July 2024 Santos emailed Protect Ningaloo by way of reminder that the consultation is closing on the 29 July 2024. [Con-5184]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Protect Ningaloo.

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from Protect Ningaloo.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
First Nations peoples and groups			
Murujuga Aboriginal Corporation (MAC)			
• On 12 July 2024 Santos emailed MAC regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet. Santos advised that based on proximity to the project and the Environment that May Be Affected (the EMBA), it considered that MAC may be a relevant person as per the NOPSEMA [Con-5246] • On 12 July 2024, MAC emailed Santos and advised it appreciated the opportunity to comment and suggested a meeting. [Con-5251] • On 12 July 2024 Santos discussed the project with MAC via phone to clarify MAC's requirements. MAC advised that EP activities have little relevance to MAC and they would like to be informed about any adverse event. A follow up meeting on Thursday 25 or Friday 26 July was planned. [Con-5252] • On 8 August 2024 Santos met with MAC. Following this meeting, and the discussions, Santos emailed MAC confirming the meeting content, that no further consultation with MAC is required; and affirmed a commitment to continue to communicate with MAC. [Con-5304]			
Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No feedback was received from Murujuga Aboriginal Corporation. Santos committed to keeping MAC informed about any adverse events that may affect their interests.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Notifications to MAC are included in the Devil Creek Pipeline and Reindeer WHP OPEP
Buurabalayji Thalanyji Aboriginal Corporation (BTAC)			
• On 12 July 2024, Santos emailed BTAC regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet. Santos advised that based on past discussions, and proximity to the project and Environment that May Be Affected (the EMBA), BTAC may be a relevant person as per the NOPSEMA Section 25 consultation guidelines. Santos requested that [Con-5248] • On 17 July 2024, BTAC emailed Santos to thank it for providing information about the EP.. BTAC notes that the EMBA appears to intersect with Thalanyji's Area of Interest, which has previously been described in the Santos-BTAC engagement protocol. BTAC advised it was open to meeting in-person or via Teams over the coming weeks. [Con-5253] • On 17 July 2024 Santos replied to BTAC's email and thanked it for the response. Santos proposed to meet at the BTAC offices and nominated its staff who should attend and provided dates that may be convenient in the next 2 weeks in Perth or Onslow. [Con-5254] • On 23 July 2024 Santos sent a further email to BTAC to enquire as a potential meeting date. [Con-5255] • On 7 August 2024, Santos emailed BTAC further to previous emails and asked that BTAC advises as soon as possible if it has comments about the EP or would like to meet in person or remotely to discuss the project. [Con-5297]. • On 9 August 2024, BTAC emailed Santos suggesting a meeting of 13 August 2024 [Con-5638] • On 9 August 2024, Santos emailed BTAC confirming this meeting. [Con-5639] • On 13 August 2024 Santos met with BTAC and provided information about Santos activities in Western Australia and the EP. [Con-5510]			

• On 14 August 2024 Santos emailed BTAC and provided a copy of the presentation given at the meeting held on 13 August 2024 and a fact sheet about current and upcoming Santos activities. [Con-5511] • On 15 August 2024 Santos emailed BTAC and provided information from Devil Creek Pipeline and Reindeer WHP OPEP outlining that First Nations groups or Registered Native Title Bodies Corporate (RNTBC) (as requested through the consultation process) will be notified in the event of a spill heading towards relevant parties interests .[Con-5514] Consultation information has been provided and steps taken as described above. BTAC has not raised any objections or claims in relation to the activities described in this EP.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
At a meeting held on 13 August BTAC enquired about oil spill preparedness and requested information about notifications to Traditional Owners in the event of an oil spill.	Santos noted and actioned BTAC's request.	Santos provided a copy of the presentation and also provided information from the OPEP outlining that First Nations groups or Registered Native Title Bodies Corporate (RNTBC) (as requested through the consultation process) will be notified in the event of a spill heading towards relevant parties interests	Notifications to BTAC are included in Table 8-4.
Nganhurra Thanardi Garrbu Aboriginal Corporation			
• On 12 July 2024, Santos emailed NTGAC regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet. . Santos advised that based on proximity to the project and the Environment that May Be Affected (the EMBA), it considers that NTGAC may be a relevant person as per the NOPSEMA Section 25 consultation guidelines. [Con-5247] • On 23 July 2024 Santos phoned NTGAC to progress a consultation protocol and left a voicemail. [Con-5256] • On 7 August 2024, Santos emailed YMAC in its administrative capacity for NTGAC further to its email of 12 July and reminded NTGAC that consultation on this activity would close on 14 August. [Con-5295] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from NTGAC.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from NTGAC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements have been met.	No response required.	Not applicable.
Ngarluma Aboriginal Corporation			
• On 12 July 2024, Santos emailed NAC regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet. Santos advised that based on past discussions, and proximity to the project and the Environment that May Be Affected (the EMBA), it considered that NAC may be a relevant person as per the NOPSEMA Section 25 consultation guidelines. [Con-5245] • On 7 August 2024, Santos emailed NAC further to its email of 12 July and reminded NAC that consultation on this activity would close on 14 August. [Con-5300] • On 8 August 2024 NAC emailed Santos to thank Santos for keeping it informed. [Con-5303] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from NAC.			

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from NAC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements have been met.	No response required.	Not applicable.

Wirrawandi Aboriginal Corporation (WAC)

- On 12 July 2024, Santos emailed WAC regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet.. Santos advised that based on proximity to the project and the Environment that May Be Affected (the EMBA), it considers that WAC may be a relevant person as per the NOPSEMA Section 25 consultation guidelines... [Con-5249]
- On 7 August 2024, Santos emailed WAC further to its email of 12 July and reminded WAC that on this activity would close on 14 August. [Con-5293]
- On 28 August 2024, Santos emailed WAC to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024. [Con-5627]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from WAC.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from WAC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements have been met.	No response required.	Not applicable.

Yamatji Marlpa Aboriginal Council (YMAC)

- On 12 July 2024, Santos emailed Yamatji Marlpa Aboriginal Council (YMAC) because of its administrative relationship with Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC). Santos advised it had written to NTGAC separately regarding consultation on the proposed activities to be managed under this EP and provided information in a factsheet. Santos advised that based on proximity to the project and the Environment that May Be Affected (the EMBA), it considers that NTGAC may be a relevant person as per the NOPSEMA Section 25 consultation guidelines. [Con-5250]
- On 7 August 2024, Santos emailed YMAC, in its capacity as NTRB for the area, and as provider of administrative support to NTGAC, and reminded YMAC that consultation on this activity would close on 14 August 2024. [Con-5295]
- On 28 August 2024, Santos emailed YMAC to confirm that the consultation period for the EP had closed and advised that any input would be required by 4 September 2024 and any comments or claims regarding the activity would need to be received within a week. [Con-5626]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from YMAC by the close of the consultation period.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from YMAC.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements have been met.	No response required.	Not applicable.

Industry associations – commercial fishing			
Australian Southern Bluefin Tuna Industry Association (ASBTIA)			
• On 8 July 2024 Santos emailed ASBTIA regarding consultation on the proposed activities to be managed under this EP, advising that consultation has commenced on 8 July and will conclude on 7 August 2024. [Con-5107] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. • On 1 August 2024 Santos emailed ASBTIA by way of reminder that the consultation is closing on the 7 August 2024. [Con-5265] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from ASBTIA			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from ASBTIA	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Commonwealth Fisheries Association (CFA)			
• On 8 July 2024 Santos emailed Commonwealth Fisheries Association (CFA) regarding consultation on the proposed activities to be managed under this EP, advising that consultation has commenced on 8 July and will conclude on 7 August 2024. [Con-5106] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 2 August 2024 Santos emailed CFA by way of reminder that the consultation is closing on the 7 August 2024. [Con-5266] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from CFA.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from CFA.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Tuna Australia (TA)			
• On 8 July 2024 Santos emailed Tuna Australia (TA) regarding consultation on the proposed activities to be managed under this EP, advising that consultation has commenced on 8 July and will conclude on 7 August 2024. [Con-5108] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 2 August 2024 Santos emailed Tuna Australia by way of reminder that the consultation is closing on the 7 August 2024. [Con-5267]			

• On 7 August 2024, Tuna Australia emailed Santos to advise that proximity to shore of both projects, including one outside the fisheries area (Devil Creek), there is unlikely to be major impacts to fishing operations and asked to be informed of vessel and operational activity. [Con-5289] • On 14 August 2024 Santos responded to Tuna Australia's letter of 7 August noting their advice that given the proximity to shore of both projects, that they do not anticipate any major impacts to fishing operations. Santos set out the mechanism by which Tuna Australia would be informed of on water vessel and operational activity on the Reindeer project . [Con-5478]			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
Tuna Australia responded that the proposed activities are unlikely to have major impacts to fishing operations.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Notifications to Tuna Australia are included in Table 8-4.
Western Australian Fishing Industry Council (WAFIC)			
• On 8 July 2024 Santos emailed WAFIC requesting them to send Santos' consultation information relating to the Reindeer and Devil Creek Gas Project. [Con-5046] To the below licence holders: – Mackerel Managed Fishery – Marine Aquarium Managed Fishery – Pilbara Fish Trawl Managed Fishery • On 10 July 2024, Santos sent an email to WAFIC to enquire when it might have an opportunity to send the below consultation materials. [Con-5112] • On 15 July WAFIC distributed Santos' consultation information on the proposed activities to be managed under this EP, advising that consultation has commenced and they have until 14 August to respond. [Con-5085] The following fisheries were contacted for this consultation: – Mackerel Managed Fishery – Marine Aquarium Managed Fishery – Pilbara Fish Trawl Managed Fishery • On 15 August 2024 WAFIC emailed Santos to advise that they did not receive any feedback from industry regarding the Reindeer/Devils Creek Gas Project EP. WAFIC asked Santos questions about the impact of operational discharges and unplanned events. [Con-5515] • On 21 August Santos emailed WAFIC and responded to their comments and questions detailed in their email of 15 August. [Con-5561]. • On 23 August WAFIC emailed Santos outlining that they had no further comments [Con-5591]			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
WAFIC stated that it had concerns about the impact of operational discharges associated with IMMR activities on commercial species and the broader marine environment, with specific reference to treated seawater containing scavenger and biocide discharged in the marine environment.	Santos has assessed the impact of discharges including treated seawater and impacts are considered ALARP	Santos responded that: Treated seawater will only be discharged as a contingency measure in the event that the preservation fluid loses effectiveness over time, and represervation of the pipeline is required to maintain integrity for future reuse or decommissioning activities. Santos has undertaken modelling of the proposed treated seawater	Section 6.8 Treated Seawater Discharge

		discharge and considered results of Whole Effluent Toxicity (WET) testing to determine the No Observable Effects Concentration (NOEC) for the treated seawater. The modelling results indicate a localised decrease in water quality as a result of the discharge and the water returns to background levels within 24 hours.	
WAFIC requested additional information from Santos on monitoring activities following discharge of treated seawater into the marine environment and what controls Santos has put in place to minimise impacts to ALARP.	Santos provided additional information on monitoring the discharge of treated seawater	Santos responded that: If the pipeline requires re-preservation water quality monitoring at the discharge location to confirm the concentration of chemicals will be carried out. A water quality monitoring program will also be developed to verify modelling outputs. Santos will implement the following controls minimise impacts and demonstrate ALARP. Implementation of chemical section procedure to ensure only environmentally acceptable products are used. Flushing the pipeline to prior to preservation with treated seawater to reduce the concentration of residual hydrocarbons and chemicals. Calibrated dosing system to ensure accuracy of chemical dosing.	Water quality monitoring control (RE-CM-55) Chemical selection procedure (RE-CM-32) Pipeline flushing to clean pipeline (RE-CM-34 Calibrated dosing system in place (RE-CM-36)
WAFIC requested additional information on the purpose of *Environmental monitoring/sampling (e.g. sediment and marine growth)* involved in Santos IMMR activity.	Santos provided information on the purpose of environmental monitoring sampling	Santos responded that: Environmental monitoring such as sediment sampling may be undertaken during the preservation period to gain an understanding of the condition of sediments with the operational area to inform future decommissioning of other activities. Marine growth removal may be undertaken during the preservation period using water jetting or brushing	Section 2.9.3.1 Environmental monitoring activities Section 2.9.6 Marine Growth Removal

		to maintain the structural integrity if the infrastructure.	
WAFIC asked if Santos had considered the cumulative impacts of decreased water quality from the proposed activities more broadly on the marine environment and was this included in the EP.	Santos confirmed cumulative impacts of decreased water quality have been considered	Santos responded that: It had considered the cumulative impacts of decreased water quality on the marine environment. Impacts to water quality, plankton, sediment quality, threatened migratory and local fauna, protected areas and social economic receptors including commercial fishers were assessed and the potential for cumulative impacts as a result of treated seawater discharge, vessel operations and IMMR activities. As the modelling results indicate a localised decrease in water quality as a result of the discharge and the water returns to background levels within 24 hours, impacts are expected temporary and localised.	Section 6.8.2 Nature and scale of environmental impacts (Treated Seawater) Section 6.8.3 Cumulative impacts (Treated Seawater)
WAFIC sought confirmation from Santos that for an unplanned spill event that Santos will include WAFIC as a contact within the oil spill response planning documents to ensure contact is made within 24 hours of the event notification.	Santos acknowledges WAFIC's concerns and provides feedback	Santos will include WAFIC as a contact within the oil spill response planning documents and ensure contact is made with WAFIC and WA commercial fisheries within 24 hours of the incident being identified if the spill has the potential to impact WA commercial fisheries.	Devil Creek Pipeline and Reindeer WHP OPEP
WAFIC sought confirmation from Santos that it retains a current list of WA commercial fisheries that could potentially be impacted by unplanned spill scenarios.	Santos acknowledges WAFIC's concerns and provides feedback	Santos retains a list of WA commercial fisheries that could potentially be impacted by unplanned spill scenarios.	Section 3.2.7.1 Commercial Fisheries
WAFIC sought confirmation from Santos that Santos as required under the Regulations will have a suitable Operational and Scientific Monitoring Program (OSMP), for the purposes of determining impacts and monitoring the recovery of the marine environment	Santos acknowledges WAFIC's concerns and provides feedback	Santos has an Operational and Scientific Monitoring Program in place for the purposes of determining impacts and monitoring the recovery of the marine environment.	Santos' OSMP

<table>
<tr><td>As previously advised, WAFIC has developed a position regarding consultation with the WA fishing industry for unplanned events https://www.wafic.org.au/what-we-do/access-sustainability/oil-gas/consultation-approach-for-unplanned-events/</td><td>Santos acknowledges WAFIC's concerns and provides feedback</td><td>Santos notes WAFIC has developed a position regarding consultation with the WA fishing industry for unplanned events</td><td>Notifications are included in the Devil Creek Pipeline and Reindeer WHP OPEP</td></tr>
<tr><td colspan="4">Western Rock Lobster (WRL)</td></tr>
<tr><td colspan="4">

On 8 July 2024 Santos emailed WRL regarding consultation on the proposed activities to be managed under this EP, advising that consultation had commenced and close on 7 August 2024. [Con-5109]

The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

On 2 August 2024, Santos emailed WRL by way of reminder that the consultation is closing on 7 August 2024. [Con-5268]
On 5 August 2024 WRL emailed Santos and noted that operations are unlikely to affect the fishery, other than unplanned events that may affect the EMBA. It noted the reference to the Santos Oil Pollution Emergency Plan (OPEP), planned control measures and mitigation strategies and the ongoing maintenance schedule. WRL advised that should the modelled EMBA be likely to cross into the fishery it seeks to participate in the associated consultation process. [Con-5276]
On 14 August 2024 Santos responded to their letter of 5 August noting that the Western Rock Lobster Fishery is unlikely to be impacted by Reindeer and Devil Creek activity and that their interests relate to the continuance of planned subsea and offshore maintenance and mitigation strategies during ongoing operations and post cessation of project life. Santos acknowledged that should proposed activity change in the future WRL would reassess their interest in this activity and would want to participate in the consultation process. [Con-5476]

</td></tr>
<tr><td>Summary of response by relevant person</td><td>Assessment of merits</td><td>Santos' response statement</td><td>EP reference</td></tr>
<tr><td>Western Rock Lobster responded that proposed activity is unlikely to impact the fishery.</td><td>This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.</td><td>No response required.</td><td>Not applicable.</td></tr>
<tr><td colspan="4">Industry associations – community</td></tr>
<tr><td colspan="4">Exmouth Community Liaison Group (CLG)</td></tr>
<tr><td colspan="4">

On 30 May 2024 Santos emailed Exmouth CLG regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4644]

The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

On 28 June 2024 Santos emailed Exmouth CLG to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-5105]
Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Exmouth CLGL.

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Summary of response of relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from Exmouth Community Liaison Group.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	Information was provided in relation to the activity in the meeting. No follow up response required.	Not applicable.

Industry associations – local industry

Exmouth Chamber of Commerce and Industry (ECCI)

- On 30 May 2024 Santos emailed ECCI regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4643]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 30 May 2024 ECCI responded to Santos with an automatic reply. [Con-4688]
- On 28 June 2024 Santos emailed Exmouth Chamber of Commerce and Industry to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4934]
- On 19 July 2024 Santos emailed Exmouth Chamber of Commerce and Industry by way of reminder that the consultation is closing on the 29 July 2024. [Con-5190]
- Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from ECCI.

Summary of response of relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from ECCI.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Karratha and Districts Chamber of Commerce and Industry (KDCCI)

- On 9 July 2024 Santos emailed KDCCI regarding consultation on the proposed activities to be managed under this EP. [Con-5110]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
  - The email advised that Santos is seeking input on proposed activities by 8 August 2024.
- On 2 August 2024, Santos emailed KDCCI by way of reminder that the consultation is closing on the 8 August 2024. [Con-5271]
- On 28 August Santos emailed KDCCI to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024.[Con-5625].
- Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from ECCI.

Summary of response or relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received KDCCI.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Onslow Chamber of Commerce and Industry (OCCI)

- On 9 July 2024 Santos emailed Onslow CCI regarding consultation on the proposed activities to be managed under this EP. [Con-5111]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
  - The email advised that Santos is seeking input on proposed activities by 8 August 2024.
- On 2 August 2024 Santos emailed Onslow CCI by way of reminder that the consultation is closing on the 8 August 2024. [Con-5263]
- On 28 August Santos emailed Onslow CCI to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024.[Con-5620]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from OCCI.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from OCCI	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Industry associations – energy

Australian Energy Producers (AEP)

- On 30 May 2024 Santos emailed AEP regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4648]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed AEP to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4897]
- On 19 July 2024 Santos emailed AEP and Industry by way of reminder that the consultation is closing on the 29 July 2024. [Con-5192]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Australian Energy Producers (formerly APPEA).

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from Australian Energy Producers (formerly APPEA).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Industry associations – tourism

Recfishwest

- On 17 July 2024 Santos phoned Recfishwest to determine whether the email sent on 9 July 2024 was received, and Recfishwest confirmed it was not. Santos resent the email regarding consultation on the proposed activities to be managed under this EP. [Con-5103]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
  - The email advised that Santos is seeking input on proposed activities by 8 August 2024.
- On 23 July 2024, Recfishwest emailed Santos to advise that as there are currently no new activities proposed, Recfishwest has no concerns relating to recreational fishing access. [Con-5244]
- On 14 August 2024 Santos responded to the Recfishwest email and noted their advice that has no concerns relating to recreational fishing access and that you would like to be kept informed as operations progress/cease and consultation begins on proposed activities beyond cessation of production. [Con-5485]

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
Recfishwest responded that it did not have any concerns in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Notifications to Recfishwest are included in Table 8-4

Marine Tourism WA

- On 30 May 2024 Santos emailed Marine Tourism WA regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4647]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Marine Tourism WA to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4896]
- On 19 July 2024, Santos emailed Marine Tourism WA by way of reminder that the consultation is closing on the 29 July 2024. [Con-5193]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Marine Tourism WA.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Marine Tourism WA.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Tourism Council of Western Australia

- On 30 May 2024 Santos emailed Tourism Council of Western Australia regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4646]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Tourism Council of Western Australia to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4895]
- On 19 July 2024 Santos emailed Tourism Council of Western Australia by way of reminder that the consultation is closing on the 29 July 2024. [Con-5194]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Tourism Council of Western Australia.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Tourism Council of Western Australia.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

WA Game Fishing Association

- On 9 July 2024 Santos emailed WA Game Fishing Association regarding consultation on the proposed activities to be managed under this EP. [Con-5104]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
  - The email advised that Santos is seeking input on proposed activities by 8 August 2024.
- On 2 August 2024, Santos emailed WAGFA by way of reminder that the consultation is closing on the 8 August 2024. [Con-5270]
- On 28 August Santos emailed WAGFA to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024. [Con-5615]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from WA Game Fishing Association.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from WA Game Fishing Association.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Western Australian Indigenous Tourism Operators Council			
• On 30 May 2024 Santos emailed Western Australian Indigenous Tourism Operators Council regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4645] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Western Australian Indigenous Tourism Operators Council (WAITOC) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4894] • On 19 July 2024, Santos emailed Western Australian Indigenous Tourism Operators Council by way of reminder that the consultation is closing on the 29 July 2024. [Con-5195] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Western Australian Indigenous Tourism Operators Council.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Western Australian Indigenous Tourism Operators Council.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Infrastructure operators			
Vocus			
• On 30 May 2024 Santos emailed Vocus regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4649] – The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Vocus to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4901] • On 19 July 2024 Santos emailed Vocus by way of reminder that the consultation is closing on the 29 July 2024. [Con-5196] • Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Vocus.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Vocus.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Local Government Authorities

Port of Dampier

- On 30 May 2024 Santos emailed Port of Dampier regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4631]
  - The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Port of Dampier to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4899]
- On 19 July 2024 Santos emailed Port of Dampier by way of reminder that the consultation is closing on the 29 July 2024. [Con-5188]
- Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Port of Dampier.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Port of Dampier.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Port of Onslow

- On 30 May 2024 Santos emailed Port of Onslow regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4630]
  - The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Port of Onslow to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4898]
- On 19 July 2024 Santos emailed Port of Onslow by way of reminder that the consultation is closing on the 29 July 2024. [Con-5189]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Port of Onslow.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Port of Onslow.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Shire of Ashburton

- On 9 July 2024 Santos emailed Shire of Ashburton regarding consultation on the proposed activities to be managed under this EP. [Con-5096]

- – The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
- – The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- – The email noted that Santos is seeking input on proposed activities by 8 August 2024.
- On 2 August 2024, Santos emailed Shire of Ashburton by way of reminder that the consultation is closing on the 8 August 2024. [Con-5262]
- On 28 August 2024 Santos emailed Shire of Ashburton to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024. [Con-5616]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Shire of Ashburton.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Shire of Ashburton.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

City of Karratha

- On 9 July 2024 Santos emailed City of Karratha regarding consultation on the proposed activities to be managed under this EP. [Con-5097]
  - – The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - – The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
  - – The email noted that Santos is seeking input on proposed activities by 8 August 2024.
- On 2 August 2024, Santos emailed City of Karratha by way of reminder that the consultation is closing on the 8 August 2024. [Con-5261]
- On 6 August 2024, City of Karratha emailed Santos regarding potential relevant City of Karratha Development Approvals. [Con-5290]
- On 16 August 2024, Santos responded to the City of Karratha email of 6 August 2024. [Con-5519]

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
City of Karratha provided information to Santos regarding Development Approval requirements for decommissioning activity.	Response related to potential future activities outside the scope of the EP.	Santos noted City of Karratha Development Approval requirements regarding future decommissioning or reuse activities.	Not applicable.

Shire of Exmouth

- On 30 May 2024 Santos emailed Shire of Exmouth regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4632]
  - – The email included an activity summary with a link to a general fact sheet and a fisher-specific fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - – The linked general fact sheet included an overview of the proposed activities; potential impacts, risks, and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

• On 30 May 2024 Shire of Exmouth responded to Santos with an automatic out of office reply. [Con-4689] • On 19 July 2024 Santos emailed Shire of Exmouth by way of reminder that the consultation is closing on the 29 July 2024. [Con-5215] • On 23 July 2024 Shire of Exmouth emailed Santos and advised its email has been forwarded to the CEO for their attention. [Con-5243] No further correspondence or feedback was received from Shire of Exmouth.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Shire of Exmouth.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Tourism Operators – Dive			
3 Islands Whale Shark Dive (Exmouth)			
• On 30 May 2024 Santos emailed 3 Islands Whaleshark Dive (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4665] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed 3 Islands Whaleshark Dive (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4922] • On 19 July 2024 Santos emailed 3 Islands Whale Shark Dive (Exmouth) by way of reminder that the consultation is closing on the 29 July 2024. [Con-5217] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from 3 Islands Whale Shark Dive (Exmouth)			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from 3 Islands Whale Shark Dive (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Aussie Marine Adventures (Exmouth & Coral Bay)			
• On 30 May 2024 Santos emailed Aussie Marine Adventures (Exmouth & Coral Bay) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4677] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Aussie Marine Adventures (Exmouth & Coral Bay) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4921] • On 19 July 2024 Santos emailed Aussie Marine Adventures (Exmouth & Coral Bay) by way of reminder that the consultation is closing on the 29 July 2024. [Con-5218]			

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Aussie Marine Adventures (Exmouth & Coral Bay).			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Aussie Marine Adventures (Exmouth & Coral Bay).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Coral Bay Eco Tours			
• On 30 May 2024 Santos emailed Coral Bay Eco Tours (Coral Bay) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4664] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Coral Bay Eco Tours (Coral Bay) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4918] • On 19 July 2024 Santos emailed Coral Bay Eco Tours by way of reminder that the consultation is closing on the 29 July 2024. [Con-5219] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Coral Bay Eco Tours.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Coral Bay Eco Tours.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Dive Ningaloo (Exmouth)			
• On 30 May 2024 Santos emailed Dive Ningaloo (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4652] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Dive Ningaloo (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4917] • On 19 July 2024 Santos emailed Dive Ningaloo (Exmouth) by way of reminder that the consultation is closing on the 29 July 2024. [Con-5220] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Dive Ningaloo (Exmouth).			

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Dive Ningaloo (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Exmouth Dive & Whalesharks (Exmouth)

- On 30 May 2024 Santos emailed Exmouth Dive & Whalesharks (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4663]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Exmouth Dive & Whalesharks (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4915]
- On 19 July 2024 Santos emailed Exmouth Dive & Whalesharks by way of reminder that the consultation is closing on the 29 July 2024. [Con-5221]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Exmouth Dive & Whalesharks.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Exmouth Dive & Whalesharks.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Exmouth Diving Centre (Exmouth)

- On 30 May 2024 Santos emailed Exmouth Diving Centre (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4662]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Exmouth Diving Centre (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4913]
- On 19 July 2024 Santos emailed Exmouth Diving Centre by way of reminder that the consultation is closing on the 29 July 2024. [Con-5222]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Exmouth Diving Centre.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Exmouth Diving Centre.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Kings Ningaloo Reef Tours (Exmouth)			
• On 30 May 2024 Santos emailed Kings Ningaloo Reef Tours (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4661] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Kings Ningaloo Reef Tours (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4912] • On 19 July 2024 Santos emailed Kings Ningaloo Reef Tours by way of reminder that the consultation is closing on the 29 July 2024. [Con-5223] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Kings Ningaloo Reef Tours.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Kings Ningaloo Reef Tours.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Monte Bello Island Safaris (Exmouth)			
• On 30 May 2024 Santos emailed Monte Bello Island Safaris (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4660] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Monte Bello Island Safaris (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4910] • On 19 July 2024 Santos emailed Monte Bello Island Safaris (Exmouth) by way of reminder that the consultation is closing on the 29 July 2024. [Con-5224] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Monte Bello Island Safaris (Exmouth).			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Monte Bello Island Safaris (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Ningaloo Blue Dive (Exmouth)			
• On 30 May 2024 Santos emailed Ningaloo Blue Dive (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4659] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.			

- The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

- On 28 June 2024 Santos emailed Ningaloo Blue Dive (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4909]
- On 19 July 2024 Santos emailed Ningaloo Blue Dive by way of reminder that the consultation is closing on the 29 July 2024. [Con-5225]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Blue Dive (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Blue Dive (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Ningaloo Discovery (Exmouth)

- On 30 May 2024 Santos emailed Ningaloo Discovery (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4658]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Ningaloo Discovery (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4908]
- On 19 July 2024 Santos emailed Ningaloo Discovery by way of reminder that the consultation is closing on the 29 July 2024. [Con-5226]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Discovery (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Discovery (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Ningaloo Reef Dive (Exmouth)

- On 30 May 2024 Santos emailed Ningaloo Reef Dive (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4657]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Ningaloo Reef Dive (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4907]
- On 19 July 2024Santos emailed Ningaloo Reef Dive by way of reminder that the consultation is closing on the 29 July 2024. [Con-5227]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Reef Dive (Exmouth).			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Reef Dive (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Ningaloo Whaleshark Dive (Exmouth)

- On 30 May 2024 Santos emailed Ningaloo Whaleshark Dive (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4656]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Ningaloo Whaleshark Dive (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4906]
- On 19 July 2024 Santos emailed Ningaloo Whaleshark Dive by way of reminder that the consultation is closing on the 29 July 2024. [Con-5228]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Whaleshark Dive (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Whaleshark Dive (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Ningaloo Whalesharks (Exmouth)

- On 30 May 2024 Santos emailed Ningaloo Whalesharks (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4655]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Ningaloo Whalesharks (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4905]
- On 19 July 2024 Santos emailed Ningaloo Whalesharks by way of reminder that the consultation is closing on the 29 July 2024. [Con-5229]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Whalesharks (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Whalesharks (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation.	No response required.	Not applicable.

	Santos considers Section 25 consultation requirements to have been met.		

Ocean Eco Adventures (Exmouth)

- On 30 May 2024 Santos emailed Ocean Eco Adventures (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4654]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Ocean Eco Adventures (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4904]
- On 19 July 2024 Santos emailed Ocean Eco Adventures (Exmouth) by way of reminder that the consultation is closing on the 29 July 2024. [Con-5230]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ocean Eco Adventures (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ocean Eco Adventures (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

View Ningaloo (Exmouth)

- On 30 May 2024 Santos emailed View Ningaloo (Exmouth) regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4653]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 31 May 2024. Lucy Tait from View Ningaloo (Exmouth) responded to Santos with thanks for the email update. [Con-4684]
- On 28 June 2024 Santos emailed View Ningaloo (Exmouth) to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4902]
- On 19 July 2024 Santos emailed View Ningaloo by way of reminder that the consultation is closing on the 29 July 2024. [Con-5231]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from View Ningaloo (Exmouth).

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from View Ningaloo (Exmouth).	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Tourism Operators – Charter operators			
Aquatic Adventures			
• On 30 May 2024 Santos emailed Aquatic Adventures regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4675] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Aquatic Adventures to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4940] • On 19 July 2024 Santos emailed Aquatic Adventures by way of reminder that the consultation is closing on the 29 July 2024. [Con-5197] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Aquatic Adventures.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Aquatic Adventures.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Blue Horizon Charters			
• On 30 May 2024 Santos emailed Blue Horizon Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4674] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Blue Horizon Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4938] • On 19 July 2024 Santos emailed Blue Horizon Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5198] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Blue Horizon Charter.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Blue Horizon Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Elite Charters			
• On 30 May 2024 Santos emailed Elite Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4673]			

- The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
- The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

- On 28 June 2024 Santos emailed Elite Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4937]
- On 19 July 2024 Santos emailed Elite Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5199]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Elite Charters.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Blue Horizon Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Evolution Charters Exmouth

- On 30 May 2024 Santos emailed Evolution Charters Exmouth regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4672]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Evolution Charters Exmouth to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4936]
- On 19 July 2024 Santos emailed Evolution Charters Exmouth by way of reminder that the consultation is closing on the 29 July 2024. [Con-5200]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Evolution Charters.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Evolution Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Exmouth Boat Hire

- On 30 May 2024 Santos emailed Exmouth Boat Hire regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4651]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Exmouth Boat Hire to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4935]

- On 19 July 2024 Santos emailed Exmouth Boat Hire by way of reminder that the consultation is closing on the 29 July 2024. [Con-5202]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Exmouth Boat Hire.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Exmouth Boat Hire.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Exmouth Fishing Adventures

- On 30 May 2024 Santos emailed Exmouth Fishing Adventures regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4671]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Exmouth Fishing Adventures to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4932]
- On 19 July 2024 Santos emailed Exmouth Fishing Adventures by way of reminder that the consultation is closing on the 29 July 2024. [Con-5203]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Exmouth Fishing Adventures.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Exmouth Fishing Adventures.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Fawesome Expeditions Exmouth

- On 30 May 2024 Santos emailed Fawesome Expeditions Exmouth regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4670]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Fawesome Expeditions Exmouth to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4931]
- On 19 July 2024 Santos emailed Fawesome Expeditions Exmouth by way of reminder that the consultation is closing on the 29 July 2024. [Con-5204]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Fawesome Expeditions Exmouth.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Fawesome Expeditions Exmouth.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Mackerel Islands Fishing Charters

- On 30 May 2024 Santos emailed Mackerel Islands Fishing Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4678]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Mackerel Islands Fishing Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4930]
- On 9 July 2024, Mackerel Islands Pty Ltd emailed Santos to advise the planned activity does not appear to impact their operation. [Con-5113]
- On 14 August 2024 Santos responded to Mackerel Islands Fishing Charters email and noted their feedback that the planned activity would not impact their operation. [Con-5486]

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
Mackerel Islands Fishing Charters responded that it did not have any concerns in relation to the proposed activities.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.

Mahi Mahi Fishing Charters

- On 30 May 2024 Santos emailed Mahi Mahi Fishing Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4681]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Mahi Mahi Fishing Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4929]
- On 19 July 2024 Santos emailed Mahi Mahi Fishing Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5205]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Mahi Mahi Fishing Charters.

Summary of response by relevant person	Assessment of merits	Santos' response statement	EP reference
No response was received from Mahi Mahi Fishing Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Ningaloo Sportfishing Charters			
• On 30 May 2024 Santos emailed Ningaloo Sportfishing Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4669] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 19 July 2024 Santos emailed Ningaloo Sportfishing Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5206] • On 28 August 2024 Santos emailed Ningaloo Sportfishing Charters to confirm that the consultation period for the EP had closed on 29 July 2024 and advised that any input would be required by 4 September 2024.[Con-5614] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Ningaloo Sportfishing Charters.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Ningaloo Sportfishing Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
Onslow Bay Boatworks			
• On 30 May 2024 Santos emailed Onslow Bay Boatworks regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4682] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation. – The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information. • On 28 June 2024 Santos emailed Onslow Bay Boatworks to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4928] • On 19 July 2024 Santos emailed Onslow Bay Boatworks by way of reminder that the consultation is closing on the 29 July 2024. [Con-5207] Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Onslow Bay Boatworks.			
Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Onslow Bay Boatworks.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.
On Strike Charters Exmouth			
• On 30 May 2024 Santos emailed On Strike Charters Exmouth regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4667] – The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.			

- The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

- On 28 June 2024 Santos emailed On Strike Charters Exmouth to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4927]
- On 19 July 2024 Santos emailed On Strike Charters Exmouth by way of reminder that the consultation is closing on the 29 July 2024. [Con-5208]
- On 20 July 2024 On Strike Charters sent an automated response advising it may take a few days to reply. [Con-5242]

No further correspondence or feedback was received from On Strike Charters Exmouth.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from On Strike Charters Exmouth.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Peak Sportfishing Adventures

- On 30 May 2024 Santos emailed Peak Sportfishing Adventures regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4666]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Peak Sportfishing Adventures to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4926]
- On 19 July 2024 Santos emailed Peak Sportfishing Adventures by way of reminder that the consultation is closing on the 29 July 2024. [Con-5209]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Peak Sportfishing Adventures.

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
No response was received from Peak Sportfishing Adventures.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Seaestar Boat Charters

- On 30 May 2024 Santos emailed Seaestar Boat Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4679]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Seaestar Boat Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4925]

- On 19 July 2024 Santos emailed Seaestar Boat Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5210]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Seaestar Boat Charters.

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from Seaeastar Boat Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Seaforce Charters

- On 30 May 2024 Santos emailed Seaforce Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4680]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Seaforce Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4924]
- On 19 July 2024 Santos emailed Seaforce Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5211]

Notwithstanding the consultation information provided and the steps described above, no comments or input were received on this EP from Seaforce Charters.

Summary of response by relevant person	*Assessment of merits*	*Santos' response statement*	*EP reference*
No response was received from Seaforce Charters.	Santos considers it has provided sufficient information and a reasonable period of time for consultation. Santos considers Section 25 consultation requirements to have been met.	No response required.	Not applicable.

Top Gun Charters

- On 30 May 2024 Santos emailed Top Gun Charters regarding consultation on the proposed activities to be managed under this EP, advising that consultation would commence on 28 June 2024 and close on 29 July 2024. [Con-4676]
  - The email included an activity summary with a link to a general fact sheet published on the Santos Consultation Hub web site, consultation requirements under relevant Environmental Regulations, directions on how to provide input into EP development and a link to additional NOPSEMA resources on consultation.
  - The linked fact sheet included an overview of the proposed activities; potential impacts, risks and management measures; and the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.
- On 28 June 2024 Santos emailed Top Gun Charters to advise that Santos was now consulting on the proposed activities, advising that the consultation period would close on 29 July 2024. [Con-4923]
- On 19 July 2024 Santos emailed Top Gun Charters by way of reminder that the consultation is closing on the 29 July 2024. [Con-5216]
- On 1 August 2024 Top Gun Charters emailed Santos and did not provide any feedback about the EP. [Con-5517]
- On 15 August 2024 Santos emailed Top Gun Charters in response to their email of 1 August 2024 to confirm that no feedback about the EP was received.[Con-5518]

Summary of response by relevant person	***Assessment of merits***	***Santos' response statement***	***EP reference***
Top Gun Charters did not provided comment on the EP.	This response does not raise an objection or claim about the adverse impact of each activity to which this EP relates.	No response required.	Not applicable.

5. Environmental impact and risk assessment

OPGGS(E)R 2023 Requirements
Regulation 21. Environmental Assessment
Evaluation of environmental impacts and risks 21(5) The environment plan must include: a) details of the environmental impacts and risks for the activity; and b) an evaluation of all the impacts and risks, appropriate to the nature and scale of each impact or risk; and c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level. 21(6) To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all the environmental impacts and risks arising directly or indirectly from: a) all operations of the activity; and b) potential emergency conditions, whether resulting from accident or any other reason.

Environmental impact and risk assessment refers to a process whereby planned and unplanned events that may or will occur during an activity are quantitatively and/or qualitatively assessed for their impacts on the environment (physical, biological and socio-economic), at a defined location and specified period of time. In addition, unplanned events are assessed based on their likelihood of occurrence, which contributes to their level of risk.

Santos has undertaken environmental impact and risk assessments for the activities' planned events (including any routine, non-routine and contingency activities) and unplanned events in accordance with the OPGGS(E)R 2023.

Provided in this section of the EP is the following information relating to the environmental impact and risk assessment approach:

- Terminology used
- Summary of the approach.

A full description of the process applied in identifying, analysing and evaluating the impacts and risks relating to the planned activity is documented in *Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline* (EA-91-IG-00004_6).

5.1 Impact and risk assessment terminology

Common terms applied during the impact and risk assessment process and used in this EP are defined in Table 5-1. For a more comprehensive listing of the terms and definitions used in environmental impact and risk assessment, refer to Santos' Environmental Hazard Identification and Assessment Guideline (EA-91-IG-00004_6).

Table 5-1: Impact and risk assessment terms and definitions

Name	Definition
Acceptability	Determined for both impacts and risks. Acceptability of events is in part determined by the consequence of the impact following management controls. Acceptability of unplanned events is in part determined from its risk ranking following management controls. For both impacts and risks, acceptability is also determined from a demonstration of the ALARP principle, consistency with Santos Policies, consistency with all applicable legislation and consideration of relevant stakeholder consultation when determining management controls.
Activity	Specific tasks and actions undertaken throughout the lifecycle of oil and gas exploration, production, and decommissioning.
ALARP	As Low as Reasonably Practicable. The term refers to reducing risk to a level that is As Low as Reasonably Practicable. In practice, this means showing through reasoned and supported arguments, that there are no other practicable options that could reasonably be adopted to reduce risks further.
Authorised Person	Person with authority to make the decision or take the action. Examples are Vessel Master, Field Superintendent, Supervisor, Person-in-Charge, Company Authorised Representative, and Project Manager.

Name	Definition
Control Measure	Means a system, an item of equipment, a person, or a procedure, that is used as a basis for managing environmental impacts and risks.
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety.
Environment	Includes the natural and socio-economic values and sensitivities which will or may be affected by the activity. Is defined by NOPSEMA and DEMIRS as: a) ecosystems and their constituent parts, including people and communities b) natural and physical resources c) the qualities and characteristics of locations, places, and areas d) the heritage value of places e) the social, economic, and cultural features of the matters mentioned in paragraphs (a), (b), (c) and (d).
Environmental Consequence	A consequence is the outcome of an event affecting objectives. Note 1 An event can be one or more occurrences and can have several cases. Note 2 An event can consist of something not happening. (Reference ISO 73:2009 Risk Vocabulary).
Environmental Impact	Defined by NOPSEMA1 as any change to the environment, whether adverse or beneficial, wholly, or partly resulting from a planned or unplanned event1. Defined by DEMIRS as any change to the environment, whether adverse or beneficial, that wholly or partly results from a petroleum activity of an operator.
ENVID	Environmental hazard identification workshop.
Environmental Risk	Applies to unplanned events. Risk is a function of the likelihood of the unplanned event occurring and the consequence of the environmental impact that arises from that event.
Hazard	A situation with the potential to cause harm.
Grossly Disproportionate	Where the sacrifice (cost and effort) of implementing a control measure to reduce impact or risk grossly exceeds the environmental benefit to be gained.
Impact Assessment	The process of determining the consequence of an impact (in terms of the consequence to the environment) arising from a planned or unplanned event over a specified period of time.
Likelihood	The chance of an unplanned event occurring.
Non-routine Planned Event	An attribute of the planned activity that may occur or will occur infrequently during the planned activity. A non-routine planned event is intended to occur at the time.
Planned Activity	A description of the activity to be undertaken, including the services, equipment, products, assets, personnel, timing, duration and location and aspect of the activity.
Planned Event	An event arising from the activity which is done with intent (i.e. not an unplanned event) and has some level of environmental impact. A planned event could be routine (expected to occur consistently throughout the activity) or non-routine (may occur infrequently if at all). Air emissions, bilge water discharge and drill cuttings discharge would be examples of planned events.
Receptor	A feature of the environment that may have environmental, social and/or economic values.
Risk	The effect of uncertainty on objectives.
Risk Assessment	The process of determining the likelihood of an unplanned event and the consequence of the impact (in terms of economic, human safety and health, or ecological effects) arising from the event over a specified period of time.
Routine Planned Event	An attribute of the planned activity that results in some level of environmental impact and will occur continuously or frequently through the duration of the planned activity.
SLT	Senior Leadership Team.
Unplanned Event	An event that results in some level of environmental impact and may occur despite preventive safeguards and control measures being in place. An unplanned event is not intended to occur during the activity.

5.2 Summary of the environmental impact and risk assessment approach

5.2.1 Overview

Santos operates under an overarching Risk Management Policy (QE-91-IF-10050). The company Risk Management General Procedure (SMS-LRG-OS01-PD01)) underpins the Risk Management Policy and is consistent with the requirements of AS/NZS ISO 31000:2018, Risk Management – Guidelines.

The key steps to risk management are illustrated in Figure 5-1 The forum used to undertake the assessment is the environmental hazard workshop, referred to as an ENVID, which is described in Section 4 of Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline (EA-91-IG-00004_6).

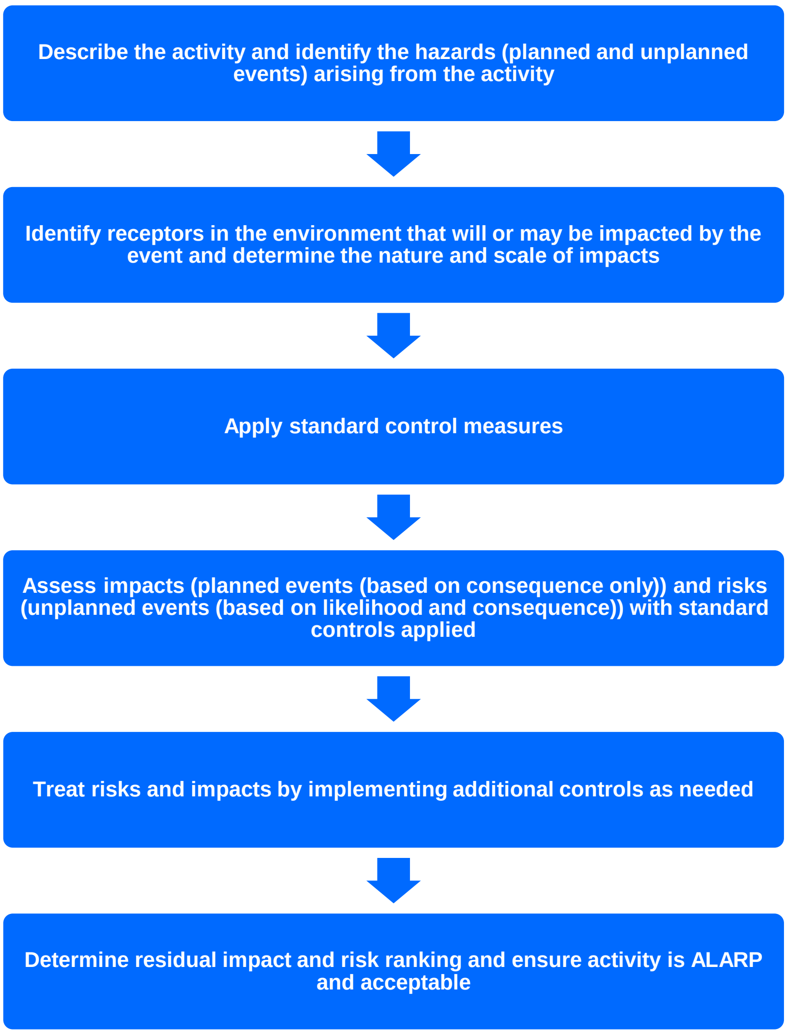

Figure 5-1: Environmental impact and risk assessment process

Santos' *Environmental Hazard Identification and Assessment Guideline* (EA-91-IG-00004) includes consideration of the following key areas in an impact and risk assessment:

- Description of the activity (including location and timing)
- Description of the environment (potentially affected by both planned and unplanned events)
- Identification of relevant persons
- Identification of legal requirements ('legislative controls') that apply to the activity
- Santos Environment, Health & Safety Policy and SMS requirements
- Principles of ecologically sustainable development

- Company-defined acceptable levels of impact and risk.

These factors were considered in two environmental impact and risk assessment workshops held on 30 April 2024 and 02 May 2024, covering both the Reindeer and Devil Creek facilities. The risk workshops involved participants from Santos as well as specialist environmental consultants with knowledge of the proposed activity, existing environment and the activity.

The workshop actions are distributed to relevant personnel, and there is continual liaison with the business units to refine activity description and consequence assessments and to determine suitable control measures.

5.2.2 Describe the activities and hazards (planned and unplanned events)

A description of the activity is required in order to determine the planned events that will take place and the credible unplanned events that may occur. The location, timing and scope of the activity must be described to determine the impacts from planned events, and the impacts and risks from unplanned events since these have a bearing upon the EMBA, by the activity.

The outcome of this assessment is detailed in the relevant sub-sections of Sections 6 and 7.

5.2.3 Identify receptors and determine the nature and scale of impacts

A description of the environment (natural and socio-economic) within which hazards from the activity will, or may occur, is required. This constitutes a crucial stage of the risk assessment, as an understanding of the environment that will or may be affected is required to determine the type and consequence of impacts from the activity being assessed. The environment must be understood with respect to the spatial and temporal limits of the activity and key resources at risk that will or could be impacted by planned and unplanned events. Santos has developed an activity specific Reindeer WHP and Offshore gas supply pipeline Operations EP Values and Sensitivities of the Marine and Coastal Environment (Appendix C) a reference document that describes the existing environment that may be affected by the activities in this EP.

The extent of actual impacts from each planned activity or risks from each unplanned activity, are assessed using, where required, modelling (e.g. hydrocarbon spills) and scientific reports. The duration of the event is also described including the potential duration of any impacts should they occur. Receptors identified as potentially occurring within impacted area(s) are detailed in Section 2.11 and Appendix C.

5.2.4 Describe the environmental performance outcomes and control measures

For each planned and unplanned event, a set of Environmental Performance Outcome(s), Control Measures, Environmental Performance Standards and Measurement Criteria are identified. The definitions of the performance outcomes, control measures, standards and measurement criteria must be consistent with the OPGGS(E)R 2023, and the NOPSEMA EP Content Requirements Guidance Note (NOPSEMA, 2019).

For any hazard, additional controls, must also be considered and either accepted for use or rejected based on whether the standard controls reduce impacts and risks to levels that are ALARP and acceptable (refer Sections 5.2.6 and 5.2.7).

Controls are allocated in order of preference according to Figure 5-2.

Control	Effectiveness	Example
Eliminate		*Removal of the risk.* Refueling of vessels at port eliminates the risks of an offshore refueling.
Substitute		*Change the risk for a lower one.* The use of low-toxicity chemicals that perform the same task as a more toxic additive.
Engineering		*Engineer out the risk.* The use of oil-in-water separator to minimise the volume of oil discharged.
Isolation		*Isolate people or the environment from the risk.* The use of bunding for containment of bulk liquid materials.
Administrative		*Provide instructions or training to people to lower the risk.* The use of Job Hazard Analysis to assess and minimise the environmental risks of an activity.
Protective		*Use of protective equipment.* Containment and recovery of spilt hydrocarbons.

Figure 5-2: Hierarchy of controls

5.2.5 Determine the impact consequence level and risk rankings (on the basis that all control measures have been implemented)

This step looks at the causal effect between the aspect/hazard and the identified receptor. Impact mechanisms and any thresholds for impacts are determined and described, using scientific literature and modelling where required. Impact thresholds for different critical life stages are also identified where relevant.

The consequence level of the impact is then determined for each planned and unplanned event using the Santos Environment Consequence Descriptors (Appendix G).

These detailed environmental consequence descriptions are based on the consequence of the impact to relevant receptors in the categories of:

- Threatened/migratory/local fauna
- Physical environment/habitat
- Threatened ecological communities
- Protected areas
- Socio-economic receptors.

This process determines a consequence level, based on set criteria for each receptor category, and takes into consideration the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem or industry level.

For unplanned events, a risk ranking is also determined using an assessment of the likelihood (likelihood ranking) of the event as well as the consequence level of the potential impact should that event occur. Likelihood rankings are provided in the Santos risk in Table 5-3.

The level of information required to determine the impact or risk assessment depends on the nature and scale of the impact or risk. This process determines a consequence level based on set criteria for each receptor category and takes into consideration the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem or industry level. Impacts to social and economic values are also considered, based on existing knowledge and feedback from stakeholder consultation. As the result of historic consultation with stakeholders, the social and economic values in the region that are of interest are evident.

A description of the consequence levels is provided in Table 5-2.

Table 5-2: Consequence level description

Consequence Level		Consequence Level Description
I	Negligible	No impact or negligible impact.
II	Minor	Detectable but insignificant change to local population, industry or ecosystem factors.
III	Moderate	Significant impact to local population, industry or ecosystem factors.
IV	Major	Major long-term effect on local population, industry or ecosystem factors.
V	Severe	Complete loss of local population, industry or ecosystem factors AND/OR extensive regional impacts with slow recovery.
VI	Critical	Irreversible impact to regional population, industry or ecosystem factors.

For unplanned events, in addition to the consequence level of the impact, a risk ranking is also determined using an assessment of the likelihood (likelihood ranking) (Table 5-3) of the impact occurring from an unplanned event. For oil spill events, potential impacts to environmental receptors are assessed where they occur within the EMBA using results from modelling. The risk matrix is provided in Table 5-4

Table 5-3: Likelihood description

No.	Matrix	Description
f	Almost Certain	6. Occurs in almost all circumstances OR could occur *within days to weeks (<4 monthly).*
e	Likely	7. Occurs in most circumstances OR could occur *within weeks to months (4 monthly – 1 yearly).*
d	Occasional	8. Has occurred before in Santos OR could occur *within months to years (1–3 yearly).*
c	Possible	9. Has occurred before in the industry OR could occur *within the next few years (3–10 yearly).*
b	Unlikely	10. Has occurred elsewhere OR could occur *within decades (10–30 yearly)*.
a	Remote	11. Requires exceptional circumstances and is unlikely even in the long term *(30–100 yearly).*

Table 5-4: Santos risk matrix

		Consequence					
		I	II	III	IV	V	VI
Likelihood	f	Low	Medium	High	Very High	Very High	Very High
	e	Low	Medium	High	High	Very High	Very High
	d	Low	Low	Medium	High	High	Very High
	c	Very Low	Low	Low	Medium	High	Very High
	b	Very Low	Very Low	Low	Low	Medium	High
	a	Very Low	Very Low	Very Low	Low	Medium	Medium

5.2.6 Evaluate whether impacts and risks are as low as reasonably practicable

For planned and unplanned events, an ALARP assessment is undertaken to demonstrate that the standard control measures adopted reduce the impact (consequence level) or risk to ALARP. This process relies on demonstrating that further potential control measures would require a disproportionate level of cost/effort in order to reduce the level of impact or risk. If this cannot be demonstrated, then further control measures are adopted. The level of detail included within the ALARP assessment is based upon the nature and scale of the potential impact or risk. For example, more detail is required for a risk ranked as `Medium' compared to a risk ranked as `Low'.

5.2.7 Evaluate impact and risk acceptability

Santos considers an impact or risk associated with the proposed activity to be acceptable if the following criteria are met:

- The consequence of a planned event is ranked as I or II; or a risk of impact from an unplanned event is ranked Very Low to Medium

- An assessment has been completed to determine whether further information or studies are required to support or validate the consequence assessment
- Assessment and management of risks have addressed the principles of ecologically sustainable development
- The acceptable levels of impact and risks have been informed by relevant species recovery plans, threat abatement plans and conservation advice can be demonstrated
- Performance standards are consistent with legal and regulatory requirements
- Performance standards are consistent with Santos Environment, Health & Safety Policy
- Performance standards are consistent with industry standards and best practice guidance (e.g. Australian Biofouling Management Requirements, Version 2 (DAFF 2023); National Biofouling Management Guidelines for the Petroleum Production and Exploration Industry (Marine Pest Sectoral Committee, 2018))
- Performance outcomes and standards are consistent with stakeholder expectations
- Performance standards have been demonstrated to reduce the impact or risk to ALARP.

the consequence and risks associated with the proposed activity are not inconsistent with the outcomes of relevant principles of ecologically sustainable development (ESD) under the EPBC Act, as summarised in Table 5-5.

Table 5-5: Activity Relevant Principles of Ecologically Sustainable Development

No.	ESD Principle	Relevance
(a)	Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations	Santos' environmental impact and risk assessment determines impact consequence levels considering the duration and extent of the impact, receptor recovery time and the effect of the impact at a population, ecosystem, or industry level. The Santos Environment Consequence Descriptors highlights the integration of long-term and short-term environmental, and socio-economic considerations (Appendix F). The assessment of impact consequence levels for the proposed activity simultaneously assesses of the activity's potential implications against this principle. Additional assessment of this principle in relation to acceptability will not be conducted.
(b)	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	For planned activities, assessment of this ESD principle is inherent in Santos' environmental impact and risk assessment process, as Santos does not proceed with activities if the consequence of a planned event is ranked III (Moderate) or above. If the residual risk is Medium to Very High and there is significant scientific uncertainty associated with the aspect, additional assessment against this principle is required.
(c)	The principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations	For planned activities, assessment of this ESD principle is inherent in Santos' environmental impact and risk assessment process, as Santos does not proceed with activities if the consequence of a planned event is ranked III (Moderate). The assessment of this principle is implemented through further details on ALARP assessment highlighting assurance that potential impacts and risks are managed, and the environment is maintained for the benefit of future generations. Evaluation of the importance and relevance of stakeholder interest for this principle, if triggered, is fundamental in demonstrating that the environment is maintained for the benefit of future generations.
(d)	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making	Evaluate if there is the potential to affect biological diversity and ecological integrity.
(e)	Improved valuation, pricing and incentive mechanisms should be promoted	This principle refers to activities which involve valuation, pricing and/or incentive mechanisms for the production, delivery, distribution or consumption of goods and services, especially those that are derived from natural or social capital or from ecological services.

5.2.8 First Nations Cultural features assessment

The definition of 'environment' under the OPGGS(E) Regulations 2023 is broad, and means:

(a) ecosystems and their constituent parts, including people and communities; and

(b) natural and physical resources; and

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(c) the qualities and characteristics of locations, places and areas; and

(d) the heritage value of places;

and includes

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

When assessing the consequence level of impact to cultural features, Santos considers the different types of cultural features and types of impacts. For impacts to cultural features, in the form of impacts to marine species that are either a cultural food source or are considered culturally significant to First Nations people, Santos assesses impacts with reference to the consequence assessment for threatened/migratory/local fauna.

Similarly, where cultural features are linked to a specific place, impacts to cultural features are assessed with reference to the consequence assessment for physical environment/threatened ecological communities/protected areas as applicable.

Where there are concerns raised about cultural and spiritual beliefs that do not link to a specific place (or physical/tangible feature), Santos will evaluate impact and risk acceptability through the consideration of:

- Impacts from other activities in the vicinity of the EP activities (e.g. historical drilling, trawl fishing activity, shipping, commercial developments).
- Information provided from people and /or organisations who assert the cultural and spiritual connections.
- Any expert assessment(s) from suitably qualified expert(s) with relevant experience and credentials.
- Culturally appropriate control measures raised by relevant people, organisations or experts; or proposed by Santos and workshopped with relevant people, organisations or experts.

Impact and risk evaluation of cultural and spiritual beliefs will not form part of an ENVID workshop, and a consequence (or risk) ranking will not be assigned. Instead, a qualitative assessment demonstrating that impacts and risks of the activity will be reduced to as low as reasonably practicable and be of an acceptable level will be presented in the EP as informed by the above considerations.

6. Environmental assessment for planned activities

OPGGS(E)R 2023 Requirements
Regulation 21(5)
The environment plan must include: a) details of the environmental impacts and risks of the activity; and b) an evaluation of all the environmental impacts and risks, appropriate to the nature and scale of each impact or risk; and c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.
Regulation 21(6)
To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all of the environmental impacts and risks arising directly or indirectly from: a) all operations of the activity; and b) any potential emergency conditions, whether resulting from an accident or any other cause.
Regulation 21(7)
The environment plan must: a) set environmental performance standards for the control measures identified under paragraph (5)(c); and b) set out the environmental performance outcomes for the activity against which the performance of the titleholder in protecting the environment is to be measured; and c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

Two ENVID workshops (as described in Section 4.3) for planned and unplanned activities were held on 30 April 2024 and 02 May 2024, covering both the Reindeer and Devil Creek facilities. This workshop identified potential sources of environmental impact associated with the planned activities for this activity. The consequence rankings resulting from the environmental assessments are summarised in Table 6-1. A comprehensive risk and impact assessment for each of the planned events, and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP and acceptable levels are detailed in the following subsections.

Table 6-1: Summary of the consequence level rankings for hazards associated with planned events

EP Section	Hazard	Residual Consequence Level
6.1.7	Noise emissions	I – Negligible
6.2	Light emissions	I – Negligible
6.3	Atmospheric emissions	I– Negligible
6.4	Seabed and benthic habitat disturbance	II – Minor
6.5	Interaction with other marine users	I – Negligible
6.6	Planned operational discharges	I – Negligible
6.7	Planned chemical and hydrocarbon discharges	I – Negligible
6.8	Treated seawater discharge	II – Negligible
6.9	Spill response operations	II – Minor

6.1 Noise Emissions

6.1.1 Description of event

Event	Anthropogenic noise emissions will be generated in the operational area a result of activities undertaken during operations and CoP phases. There is little noise -generating equipment on the platform since processing of hydrocarbons occurs at the DCGP and the platform is unmanned. The main sources of noise emissions during the activities include noise from: • The operation of the WHP (low-level noise from gas-driven microturbine generator, pumps for chemical injection and hydraulics on the platform) • Operation of a diesel generator • Inspection, maintenance, monitoring and repair activities of the platform and other subsea infrastructure (e.g. use of ROV, SBP, SBES, MBES, SSS, AUV, diving operations, marine growth cleaning, pigging, modification and replacement of components) • Support vessel activities (e.g. DP, vessel engines, thrusters and other machinery) • Operation of a noise-emitting device on the WHP to deter birds to allow safe helicopter landings and take-offs • Use of unmanned aerial vehicles and helicopter activities in the operational area. Noise originating from these sources could potentially have a negative physiological or behavioural effect on marine fauna.
Extent	Impacts from all potential noise sources will be localised. This is based on: • A support vessel using main engines and bow thrusters to maintain position will become inaudible above background noise within an ~20 km radius. • A conservative estimate for the use of geophysical equipment (SBESs, MBESs, SSS and SBP) is within a few hundred metres radius depending on the activity characteristics. • Helicopter and unmanned aerial vehicle noise will be highly localised as the majority of the noise will not transfer into the water. • Production equipment noise will be inaudible within 1 to 2 km of the platform. • ROV, AUV and diving operations will occur adjacent to subsea infrastructure. • Bird deterrent activities taking place in one location (on the WHP)
Duration	Intermittently around the subsea infrastructure and Reindeer WHP within the operational area.

6.1.1.1 Noise generated from support vessels

Vessel operational noise consists of machinery noise (e.g. engine noise, propeller cavitation, thrusters) and hydrodynamic noise (e.g. water flowing past the hull and propeller singing). Machinery on a ship radiates sound through the hull into the water. However, sound emitted from support vessels differs significantly depending on factors such as speed, size, load, type and state of propulsion system, and meteorological and oceanographic conditions, such as sea surface and currents (MacGillivray et al. 2018)

For support vessels, the noisiest anticipated activity is when the vessel uses thrusters to maintain its position. McCauley (1998) measured underwater sound pressure levels equivalent to ~182 dB re 1 µPa @ 1 m with a frequency range of 20 Hz to 10 kHz fr.om a support vessel holding station in the Timor Sea. The thruster noise dropped below 120 dB re 1 µPa within 3–4 km and was audible above ambient noise up to 20 km away (McCauley 1998). This has been taken as the greatest noise-generating activity for assessment purposes, as other vessel activities will require the vessel to be idle or moving; e.g. McCauley (1998) measured underwater sound levels from the Pacific Ariki, a 64 m long support vessel with 8000 HP (6,000 kW) main engines during calm conditions in the Timor Sea in 110 m of water while transiting at 11 knots, and found the distance to 120 dB re 1 µPa to be ~1 km.

More recently, Koessler and McPherson (2020) modelled underwater sound levels from an offshore support vessel (OSV) in 90 m of water, with underwater SPL of 183 dB re 1 µPa @ 1 m whilst operating all three thrusters. The modelling indicated that thruster noise dropped below 120 dB re 1 µPa within 4–5 km. This has been taken as the greatest noise-generating activity for assessment purposes, as other vessel activities will require the vessel to be idle or moving, e.g. inspection and maintenance activities will typically require the vessel to be moving slowly at around four knots.

6.1.1.2 Noise Generated by Remote Operated Vehicles Operations

As underwater sound levels are dependent on the primary (noisiest) sound source rather than being strictly additive, and since ROV operations will be undertaken from a vessel, they will make little contribution to the overall noise emissions associated with vessel activities, as described above and are not risk assessed further.

6.1.1.3 Single-beam and multi-beam echo sounders and side scan sonar

Side scan sonar (SSS), single-beam echo sounders (SBESs) and multi-beam echo sounders (MBESs) are used to develop high-resolution images of the seafloor or objects on the seafloor such as subsea infrastructure. Sound pressure levels for SBESs and MBESs typically range from 210–245 dB re 1 µPa @ 1 m, and SSS typically range from 220–226 dB re 1 µPa @ 1 m (DECC, 2011).

A modelling study completed in 2013 (Zykov, 2013) indicated the maximum distances at which sound pressure levels were reduced to just above background level (120 dB re 1 µPa) from different equipment types. These were:

- MBES: Approximately 1 km from the sound source
- SBES: Approximately 350 m from the sound source
- SSS: 1.5 km from the sound source.

SDES, MBES and SSS used for surveys have the potential to cause some temporary behavioural disturbance to marine fauna, however noise levels are well below injury thresholds. Due to the short duration chirps, the temporary and intermittent use and the mid-frequencies used by positioning and survey equipment, the acoustic noise from the survey equipment is unlikely to have a substantive effect on the behavioural patterns of marine fauna.

6.1.1.4 Sub-bottom profiler

The output from boomer SBP systems is highly dependent on the model and operational power levels. Measurement of an Applied Acoustics AP3000 boomer SBP operating at both 750 and 1000 J, is reported in Martin et al. (2012). This boomer had a primary frequency range of 100–1,000 Hz. During the study, the acoustic data were collected as close as 8 m to the source and directly below it. The data showed that the broadband source level for the system was 203.3 dB 1 µPa @ 1 m SPL over 0.2 ms window length and 172.6 dB re 1 µPa2s @ 1 m SEL. They found that even with the closest measurement at 8 m, SPL values never exceeded 175 dB re 1 µPa, with the distance to 160 dB re 1 µPa calculated to be 12 m, and the unweighted accumulated SEL over an entire measurement track (525 impulses) in 28 m of water which passed directly over the recorder while operating at 1000 J was 161.5 dB re 1 µPa2s.

6.1.1.5 Noise generated from a helicopter and Unmanned Aerial Vehicle

Sound traveling from a source in the air (e.g. a helicopter) to a receiver underwater is affected by both in-air and underwater propagation processes, which are further complicated by processes occurring at the air-seawater surface interface (e.g. wind and waves). The level of noise received underwater depends on source altitude and lateral distance, receiver depth, water depth, and other variables.

Helicopter engine noise is emitted at various frequencies however, the dominant tones are typically low frequency and below 500 Hz (Richardson et al. 1995). Sound pressure in the water directly below a helicopter is greatest at the surface and diminishes with increasing receiver depth. Noise also reduces with increasing helicopter altitude, but the duration of audibility often increases with increasing altitude, with sound penetrating water at angles less than 13°. The noise from the flyover of a Bell 214 helicopter (stated to be one of the noisiest) has been recorded underwater and was audible underwater for only 38 seconds at 3 m depth and 11 seconds at 8 m depth (Richardson et al. 1995). Noise levels reported for Bell 212 helicopter during fly-over are 162 dB re 1 µPa and for Sikorsky-61 is 108 dB re 1µPa at 305 m (Simmonds et al. 2004). It is expected that underwater sounds as a result of helicopter activity will only be for very brief periods during landing and take-off.

Noise generated by the use of Unmanned Aerial Vehicles (UAV)s will be generated above the sea surface. The noise emitted by UAVs and which penetrates the sea surface is less than the noise generated by support vessels which the UAV is launched from and the UAV operators will be on. In this way the impacts of noise from the UAV underwater are considered negligible comparatively. The noise (and presence) of the UAV is likely to result in short term intermittent behavioural responses from seabirds.

6.1.1.6 Noise generated from machinery equipment on the WHP

Noise is also generated by equipment such as generators and pumps on the topsides infrastructure. Noise from WHP operations, maintenance or well intervention or suspension activities, such as plant modifications, is expected to be low as all operating equipment, including generators, engines and machinery, and is above sea level. The frequency and level of noise received underwater from the WHP topsides will depend on a number of variables, including the type of infrastructure; the types and sizes of engines, and the local hydroacoustic and geoacoustic environment (Erbe, 2011).

An estimate of underwater noise from a WHP's machinery has been drawn from a study by McCauley (1998) of noise from a drilling rig when it is working but not drilling, with the rig tender at anchor. The comparison is considered conservative, thus overestimating the sound being produced from a wellhead platform. The highest level encountered by McCauley (1998) was recorded at the wellhead, with 117 dB re 1 µPa at 125 m. This noise was audible up to 1–2 km away.

Impacts to marine fauna from noise, generated by bird deterrent devices, will depend on the frequency range and intensity of the noise produced. As sounds increase in wavelength with distance from the source, higher frequencies experience rapid loss. The noise generated by bird deterrent devices is high frequency which is outside the sensitive range for marine fauna. The bird deterrent system will be operated in a band width of ~118–137 MHz. The acoustic footprint of the audio device is estimated to be 1500 m above water based on a maximum potential noise level at source of 148 dB. As the system will be installed on the helideck well above the waterline, the level of noise penetrating underwater will be significantly lower.

Any impacts to birds will be short term intermittent local avoidance only to a small proportion of local populations. In addition, the device will be operated in accordance with the Santos Bird Management Plan for the Reindeer Offshore Platform (EA-00-RI-10191), which includes optimisation of the maximum noise level emitted based on bird response to the noise as it is gradually increased.

6.1.2 Nature and scale of environmental impacts

Potential receptors: marine mammals, marine turtles, fish and sharks, seabirds

Noise generated from the activities may result in physiological or behavioural impacts to fauna including marine mammals, marine turtles, fish and sharks, and seabirds. The generated noise is short in duration and is expected to be reduced to background levels within kilometres to tens of kilometres, therefore any impact to fauna is expected to be temporary and short-ranged.

Marine fauna use sound in a variety of functions, including social interactions, foraging, orientation and responding to predators. Underwater noise can affect marine fauna in three main ways:

- Injury to hearing or other organs. Hearing loss may be temporary (temporary threshold shift (TTS)) or permanent (permanent threshold shift (PTS))
- Disturbance leading to behavioural changes or displacement to fauna. The occurrence and intensity of disturbance is highly variable and depends on a range of factors relating to the animal and situation
- Masking or interfering with other biologically important sounds (including vocal communications, echolocation, signals and sounds produced by predators or prey).

The extent of the impacts of underwater noise on marine animals will depend upon the frequency range and intensity of the noise produced and the type of acoustic signal (i.e. continuous (WHP, support vessels) or impulsive (SSS)).

6.1.2.1 Marine mammals

No known aggregation, resting, breeding or feeding areas for cetaceans lie in close proximity to the operational area. However, cetaceans may travel through the area, with the operational area overlapping the migration BIA for the humpback whale and the distribution BIA for the pygmy blue whale. The humpback whale is expected to be the most frequently encountered particularly during annual migrations given the overlap area with the migration BIA.

The potential impacts of anthropogenic noise on marine mammals, specifically cetaceans, have been the subject of considerable research. Current data and predictions show that marine mammal species differ in their hearing capabilities, in absolute hearing sensitivity, as well as frequency band of hearing (Richardson et al. 1995; Wartzok and Ketten 1999; Southall et al. 2007).

Impulsive noise

Exposure to impulsive noise may be more hazardous to hearing than continuous (non-impulsive) noise. SSS, MBES and SBP produce impulsive noise source anticipated for the activity. Thresholds that detail receptor noise impacts and behavioural response for impulsive noise is detailed in Table 6-2.

Table 6-2: Impulsive noise: Unweighted SPL, SEL_{24H} and PK thresholds for acoustic effects on marine mammals

Hearing Group	NOAA (2019)	NMFS (2018); Southall et al. (2019)			
	Behaviour	PTS onset thresholds (received level)		TTS onset thresholds (received level)	
	SPL (L_p; dB re 1 µPa)	Weighted SEL24h (LE,24h; dB re 1 µPa2·s)	PK (Lpk; dB re 1 µPa)	Weighted SEL24h (LE,24h; dB re 1 µPa2·s)	PK (Lpk; dB re 1 µPa)
Low-frequency cetaceans	160	183	219	168	213
Mid-frequency cetaceans		185	230	170	224

The measurement study from Martin et al. (2012) indicates that the threshold for behavioural disturbance (Table 6-2) could be exceeded within less than 10 m. PTS and TTS due to SEL is not predicted to occur, considering that a measurement of along a trackline with a closest point of approach of 4 m did not result in accumulated unweighted levels higher than 121.5 dB re 1 µPa2s. PTS and TTS considering PK is unlikely to occur given the measurement of 170 dB re 1 µPa PK at 40 m. Therefore, considering both SEL and PK metrics within the criteria (Table 6-2), PTS and TTS due to the MBES are not actually predicted to occur.

The sound levels from SSS are described in Section 6.1.1.3. The measurement study Austin et al. (2013) indicates that the threshold for behavioural disturbance (Table 6-2) could be exceeded within less than 130 m for marine mammals present within the highly directional source output beam pattern. The reported per-pulse sound levels at 40 m are similar to those from the MBES, and as it is not predicted to exceed either the PTS or TTS criteria considering both for both SEL and PK metrics (Table 6-2), neither is the SSS. Additionally, the per-pulse peak pressure source level of the SSS is below the PK criteria threshold, therefore the criteria cannot be exceeded and PTS and TSS impacts are not predicted to occur.

The sound levels from an SBP system is described in Section 6.1.1.4. The modelling results from McPherson and Wood (2017) and Wood and McPherson (2019) indicates that the threshold for behavioural disturbance (Table 6-2) could be exceeded within less than 145 m for the boomer, the louder of the two SBP systems. PTS due to SEL is not predicted to occur, although the SEL24h threshold for TTS could be exceeded within 10 m of the source. None of the PK metric criteria (Table 6-2) are exceeded.

Behavioural response to acoustic exposure is generally variable, context-dependent, and less predictable than the effects of noise exposure on hearing or physiology. Hence, it is difficult to determine thresholds for behavioural response in individual cetaceans as the way they respond often varies (Nowacek et al. 2004, Gomez et al. 2016, and Southall et al. 2019) and is influenced by both biological and environmental factors such as age, sex and the activity at the time. Observed disturbance responses to anthropogenic sound in cetaceans include altered swimming direction; increased swimming speed including pronounced ‘startle’ reactions; changes to surfacing, breathing and diving patterns; avoidance of the sound source area and other behavioural changes.

Non-impulsive noise

For non-impulsive noise, the US National Marine Fisheries Service (NMFS) currently uses step function (all-or-none) threshold of 120 dB re 1 µPa SPL (unweighted) to assess and regulate noise-induced behavioural impacts for marine mammals (NOAA 2019) whilst for impulsive noise, NMFS uses step function thresholds of 160 dB re 1 µPa SPL (unweighted) (NOAA 2018, NOAA 2019). The behavioural disturbance threshold criteria applied summates the most recent scientific literature on the impacts of sound on marine mammal hearing and is therefore considered the most relevant to this activity.

Behavioural responses from aircraft have been observed as follows:

- Reactions of cetaceans to circling aircraft (fixed wing or helicopter) are sometimes conspicuous if the aircraft is below an altitude of 300 m, uncommon at 460 m and generally undetectable at 600 m (NMFS 2001).
- Baleen whales sometimes dive or turn away during overflights, but sensitivity seems to vary depending on the activity of the animals. The effects on cetaceans seem transient, and occasional overflights probably have no long-term consequences on cetaceans.

These responses are relevant to understanding the potential impacts of helicopter operations within the operational area.

Auditory masking impacts may occur when there is a reduction in audibility for one sound (signal) caused by the presence of another sound (noise). For this to occur the noise must be loud enough and have a similar frequency to the signal and both signal and noise must occur at the same time. Therefore, the closer the whale is to the vessel, and the more overlap there is with their vocalisation frequencies, the higher the probability of masking. The potential for masking and communication impacts is therefore classified as high near the vessel (within tens of metres), moderate within hundreds to low thousands of metres (Clark et al. 2009). There is a potential for auditory masking impacts to whales due to vessel noise; however, impacts are considered temporary and localised because the individual and the support vessels will be almost constantly moving and therefore no single area will be impacted for any length of time.

The EPBC Act–listed species expected to be within or move through the operational area or a 20 km radius and therefore potentially be impacted by underwater noise are listed in Section 2.13. These include three threatened species the sei whale (vulnerable), blue whale (endangered), fin whale (vulnerable), likely to occur in the operational area with several migratory species (likely to transit the operational area (Bryde's whale humpback whale, Australian snubfin dolphin, killer whale and Australian humpback dolphin spotted bottlenose dolphin and dugong). Conservation Management Plan for the Blue Whale, 2015–2025 (Commonwealth of Australia, 2015) and the Conservation advice for *Balaenoptera physalus* (fin whale) (2015) identifies noise interference as a risk. They require that risk of noise interference is evaluated and, if required, appropriate mitigation measures are implemented. Shipping noise in busy shipping channels is also identified as a potential source of noise emissions, although the risk assessment determines that consequences would be restricted to individuals, and no population level effects expected. The Conservation Management Plan for the Blue Whale requires that anthropogenic noise in distribution areas will be managed such that any blue whale continues to utilise the area without injury. As injury is not expected as a result of continuous sound sources resulting from the activity, impacts will be managed in adherence with the Management Plan.

Table 6-3: Continuous noise: Acoustic effects of continuous noise on low-frequency cetaceans: Unweighted SPL and SEL24h thresholds

Hearing Group	NOAA (2019)	NMFS (2018); Southall et al. (2019)	
	Behavioural	PTS onset thresholds (received level)	TTS onset thresholds (received level)
	Sound Pressure Level (SPL) (L_p; dB re 1 µPa)	Weighted SEL24h ($L_{E,24h}$; dB re 1 µPa2·s)	Weighted SEL24h ($L_{E,24h}$; dB re 1 µPa2·s)
Low-frequency cetaceans	120	199	179
High-frequency cetaceans		198	178

Impact summary

The estimated distances to behavioural and physiological thresholds (as listed in Table 6-3) for marine mammals from support vessels are provided in Table 6-4.

Table 6-4: Estimated distances to behavioural and physiological thresholds (as listed in Table 6-9) for marine mammals from support vessels.

Potential marine fauna receptor	Estimated distance	Justification
PTS		
Low-frequency cetaceans	12 m	Based upon accumulation of unweighted SEL over 24 hours for a vessel with a source level of 166.3 Db re 1 µPa (SPL), and applying practical spreading loss
Mid-frequency cetaceans	Not predicted to occur	Not predicted to occur for support vessels with a significantly greater power output (McPherson et al. 2019)
TTS		
Low-frequency cetaceans	266 m	Based upon accumulation of unweighted SEL over 24 hours for a vessel with a source level of 166.3 dB re 1 µPa (SPL), and applying practical spreading loss
Mid-frequency cetaceans	Not predicted to occur	Not predicted to occur for support vessels with a significantly greater power output (McPherson et al. 2019)
Behavioural		
Low-frequency cetaceans	Within 4-5 km	Considering a vessel with a source level of 183 dB re 1 µPa (SPL) Koessler and McPherson (2020)
Mid-frequency cetaceans		

Impacts to marine mammals are not considered significant as:

- Continuous sound sources are expected to be below the PTS onset threshold for low and high-frequency cetaceans, and will fall quickly to below the TTS onset threshold with distance from the source
- Marine mammals may show behavioural responses to noise emissions; however, this is expected to be localised (~4–5 km from the support vessels)
- Impulsive sound sources are expected to be below the PTS and TTS onset threshold
- Cumulative effects from the activity and from other activities conducted in the vicinity are not expected, due to low sound levels generated by continuous noise sources
- The operational area is located within migration and distribution BIAs, however behavioural responses could be expected within 4-5 km from the support vessels. This represents a small proportion of the overall BIAs and is unlikely to present a barrier to movement or disrupt migratory pathways or behaviour. Impacts will be managed in adherence with the Blue Whale Conservation Management Plan 2015–2025 (DotE 2015a)
- Helicopter noise will be intermittent during the activity and below the threshold for PTS and TTS

6.1.2.2 Marine turtles

There are four species of marine turtle that may occur within the operational area: flatback, hawksbill, green and loggerhead (refer to Section 2.13). The operational area overlaps with internesting buffer BIAs for flatback turtles and also areas that have been identified as habitat critical for the survival of flatback, green and hawksbill turtles (Table 3-9).

The Recovery Plan for Marine Turtles in Australia (DoEE 2017) highlights noise interference from anthropogenic activities as a threat to marine turtles. The plan refers to vessel noise and the operation of some oil and gas infrastructure as sources of chronic (continuous) noise in the marine environment, exposure to which may lead to avoidance of important turtle habitat. whilst for impulsive noise, NMFS uses step function thresholds of 160 dB re 1 µPa SPL (unweighted) (NOAA 2018, 2019).

There is a paucity of data regarding responses of turtles to acoustic exposure, and no studies of hearing loss due to exposure to loud sounds. Popper et al. (2014) suggested thresholds for onset of mortal injury (including PTS) and mortality for sea turtles and, in absence of taxon-specific information, adopted the levels for fish that do not hear well (suggesting that this likely would be conservative for sea turtles).

Finneran et al. (2017) proposed revised thresholds for sea turtle injury and hearing impairment (TTS and PTS). Their rationale is that sea turtles have best sensitivity at low frequencies and are known to have poor auditory sensitivity (Bartol and Ketten 2006; Dow Piniak et al. 2012; Martin et al. 2012). Accordingly, TTS and PTS thresholds for turtles are likely more similar to those of fishes than to marine mammals (Popper et al. 2014).

Studies show that behavioural responses such as an increase in swimming activity occurred with received sound levels of ~166 dB re 1 µPa and an avoidance response and behaving erratically occurred at around 175 dB re 1 µPa (McCauley et al. 2000). These levels overlap with the sound frequencies produced by support vessels. Based on the limited data regarding noise levels that illicit a behavioural response in turtles, the lower level of 166 dB re 1 µPa level drawn from National Science Foundation (NSF) (2011) is typically applied, both in Australia and by NMFS, as the threshold level at which behavioural disturbance could occur.

The recommended criteria for continuous sound sources are shown in Table 6-5.

Table 6-5: Acoustic effects of continuous noise on sea turtles

Potential Marine Fauna Receptor	Popper et al. 2014		Finneran et al. (2017) Weighted SEL_{24h} ($L_{E,24h}$; dB re 1 µPa^2·s)	
	Masking	Behaviour	PTS onset threshold	TTS onset threshold
Marine Turtle	(N) High (I) High (F) Moderate	(N) High (I) Moderate (F) Low	220	200

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) – hundreds of metres, and far (F) – thousands of metres.

SSS equipment are considered impulsive sources for this assessment, therefore the criteria from Popper et al. (2014) for seismic airguns, an impulsive source, has been adopted (Table 6-6).

Table 6-6: Impulsive noise: Criteria for impulsive noise exposure for turtles

Potential marine fauna receptor	Masking	Behaviour	TTS	Recoverable injury	Mortality and potential mortal injury
Marine Turtle	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	>210 dB SEL24h or >207 dB PK

Source: Adapted from Popper et al. (2014)

Based on the criteria detailed within Table 6-5 there is a low risk of any injury to marine turtles from vessel noise (Section 6.1.1.1.). Behavioural changes, e.g. avoidance and diving, are only predicted for individuals near the activity vessels (high risk of behavioural impacts within tens of metres of a vessel and moderate risk of behavioural impacts within hundreds of metres of a vessel). There is a high risk of masking within hundreds of metres of the vessel, and a moderate risk of masking within thousands of metres from the vessel. Turtles have not been shown to have a reliance on sound for finding food or avoiding predators. Sounds potentially could be used by turtles in a social manner to synchronise activities during the nesting season (Ferrara et al., 2014), however this has not been demonstrated for sea turtles. The noises are relatively quiet (Ferrara et al., 2014), and thus would only have a limited range of detection by turtles even in ideal conditions, with masking from natural sounds likely. The impacts from masking are expected to be low.

The sound levels of the typical survey equipment are below those associated with the PK criteria for injury (Table 6-6) beyond a few metres and are low enough that SEL criteria will not be reached (McPherson and Wood, 2017). Recoverable injury and TTS could occur within tens of metres applying the relative risk criteria from Popper et al. (2014) (Table 6-6). Behavioural changes, e.g. avoidance and diving, are only predicted for individuals near the source (high risk of behavioural impacts within tens of metres of source and moderate risk of behavioural impacts within hundreds of metres of the source).

Turtles are unlikely to experience masking even at close range to the source from all sources except the boomer SBP. This is in part because the sounds from most survey and positioning equipment (except the boomer SBP) are all outside of the hearing frequency range for turtles, which for green and loggerhead turtles is ~50–2000 Hz, with highest sensitivity to sounds between 200 and 400 Hz (Ridgway et al. 1969, Ketten and Bartol 2005, Bartol and Ketten 2006, Bartol 2008, Yudhana et al. 2010, Piniak et al., 2011, Lavender et al., 2012, 2014). The boomer SBP could potentially mask turtle hearing, as it has a primary frequency range from 100–1,000 Hz, however the low source levels mean the distances within which masking may occur for turtles will only be within hundred to low thousands of metres.

6.1.2.3 Sea snakes

There is limited information about the effects of noise on sea snakes. A current research project investigating the impacts of seismic surveys found that hearing sensitivity of sea snakes is similar to species of fish without a swim bladder (discussed below). Therefore, it is considered that there is a moderate risk in the near and intermediate distances (which extends hundreds of metres) of behavioural impacts to sea snakes, with the impacts being limited to temporary avoidance of the area.

6.1.2.4 Sharks, fish and rays

All fish species can detect noise sources, although hearing ranges and sensitivities vary substantially between species (Dale et al. 2015).

Thresholds for PTS and recoverable injury are between 207 dB PK and 213 dB PK (depending on the presence or absence of a swim bladder), and the threshold for TTS is 186 dB SELcum (Popper et al. 2014). Given there is no exposure criteria for sharks and rays, the same criteria are adopted, though typically sharks and rays do not possess a swim bladder.

Individual demersal fish may be impacted in the vicinity of the activity other mobile pelagic species may transverse the operational area. However, the operational area is not known to be an important spawning or aggregation habitat for commercially caught targeted species. Therefore, no impacts to fish stocks are expected.

Whale sharks could potentially be impacted from operational noise, especially around the time of aggregating events off the Ningaloo coast since whale sharks could potentially migrate through the operational area while transiting to these aggregations. As described in Section 2.11, a BIA for whale shark foraging occurs within the operational area; however, this BIA is wide and the operational area only overlaps a small portion of it.

Whale sharks could potentially be impacted from operational noise if in the area. Whale sharks would be expected to show avoidance to vessel noise, although they are likely to tolerate low level noise, as they have been observed swimming close to oil and gas platforms on the NWS.

The criteria defined in Popper et al. (2014) for continuous (Table 6-7) and impulsive (Table 6-8) noise sources have been adopted.

Table 6-7: Continuous noise: Criteria for noise exposure for fish

Potential marine fauna receptor	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	(N) Low (I) Low (F) Low	170 dB SPL for 48 h	158 dB SPL for 12 h	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Fish eggs and fish larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) – hundreds of metres, and far (F) – thousands of metres.

Source: Adapted from Popper et al. (2014)

Table 6-8: Impulsive noise: Criteria for noise exposure for fish

Potential marine fauna receptor	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: No swim bladder (particle motion detection)	> 219 dB SEL_{24h} or > 213 dB PK	> 216 dB SEL_{24h} or > 213 dB PK	>> 186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder not involved in hearing (particle motion detection)	210 dB SEL_{24h} or > 207 dB PK	203 dB SEL_{24h} or > 207 dB PK	>> 186 dB SEL_{24h}	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim bladder involved in hearing (primarily pressure detection)	207 dB SEL_{24h} or > 207 dB PK	203 dB SEL_{24h} or > 207 dB PK	186 dB SEL_{24h}	(N) Low (I) Low (F) Moderate	(N) High (I) High (F) Moderate
Fish eggs and fish larvae	> 210 dB SEL_{24h} or > 207 dB PK	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Note: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N) – tens of metres, intermediate (I) – hundreds of metres, and far (F) – thousands of metres. Source: Adapted from Popper et al. (2014)

Based on available criteria from Popper et al. (2014), potential impacts of survey equipment on fish have been assessed. Impulsive noises from survey equipment could result in physiological impacts to fish located within metres of the sound source. The likelihood of fish being close enough to the sound source for physiological impacts to occur is considered remote. Given these activities are short term in nature it is unlikely that fishes and sharks would persist in the area long enough for impacts to occur.

Behavioural impacts to fish from survey equipment noise will be limited to behavioural responses within metres of the noise source. Fish (including sharks and rays) may be temporarily displaced from the vicinity of the noise emissions. The only survey equipment with energy below 1 kHz is the boomer SBP, all other equipment which operates at higher frequencies is unable to be heard by most fish, which further reduces the risk of impact (Ladich and Fay 2013).

The impact of masking is low at all ranges, apart from fish who specialise in pressure detection, which can be impacted in a moderate way at thousands of metres. However, this is only relevant for the boomer SBP, as all other sources have signals outside the hearing range of most fish in the region, which reduces the risk of impact.

Based on criteria developed by Popper et al. (2014) for noise impacts on fish, vessel and continuous WHP noise has a low risk of resulting in mortality and a moderate risk of TTS impacts when fish are within tens of metres of a vessel. The most likely impacts to fish from noise will be behavioural responses. Popper et al. (2014) identified a moderate risk of behavioural impacts to fish in near (tens of metres) and intermediate distances (hundreds of metres) from the noise source. Masking could occur within thousands of metres under a worst-case scenario of vessel operations, however typically any effect will be limited to within hundreds of metres

Continuous noise sources are below PTS and TTS criteria for fish. Considering the open-ocean location of the operational area, impacts are not considered significant based on the following:

- Noise levels from the WHP, helicopters and support vessels that may cause behavioural responses are expected to generally be confined to the operational area and concentrated within a radius of a few hundred metres of the noise source.
- Noise effects to fish may result in indirect impacts to fisheries in the operational area that are restricted to moderate within hundreds of metres of the WHP / support vessels, as detailed above. With the majority of the noise emissions being of short duration and of limited extent, any impact on commercial or recreational fishing is expected to be minimal.
- Masking could occur within thousands of metres under a worst case scenario of vessel operations; however, risk of masking is low and typically any effect will be limited to within hundreds of metres.
- For impulsive noise sources behavioural impacts to fish from survey equipment noise will be limited to behavioural responses within metres of the noise source. The SSS operates at higher frequencies and is unable to be heard by most fish, which further reduces the risk of impact (Ladich and Fay 2013).

6.1.2.5 Seabirds

Seabirds occupy or pass through areas where they may hear noise from underwater activities as well as airborne activities. Seabirds are unlikely to be directly affected by noise generated underwater during the activities due to the low levels of noise that would reach them; however there may be impacts from noise generated by airborne activities as discussed in the following paragraph.

The wedge-tailed shearwater and roseate tern breeding BIAs overlap the operational area. Noise emitted by the bird deterrent device aims to have a short term, intermittent behavioural impact on birds to prevent them breeding and nesting on the WHP. By encouraging them to stay away, this will protect birds from helicopter strike and make the platform safe for helicopters to land on/take-off from. If the regular but intermittent use of the bird deterrent system does not deter birds from using the platform, then it will also be used prior to helicopter take-off and landing. The more random nature of noise prior to helicopter take-off and landing is expected to minimise the risk of bird strike and provide safe conditions for take-off and landing manoeuvres. Detrimental impacts to seabirds from bird deterrent devices are not expected to affect population levels nor are they expected to displace birds from BIAs that have been identified within proximity to the activities.

6.1.2.6 Plankton and invertebrates

Benthic invertebrates are unlikely to be negatively impacted from noise generated from the WHP and vessel operations due to the fact that vessel based activities within the pipeline corridor are intermittent and short duration with vessels not typically sitting in one location for a period of time; and the noise emitted from the WHP is low level machinery noise. Additionally, there is no convincing scientific evidence for any significant effects induced by non-impulsive noise in benthic invertebrates.

Plankton, including fish eggs and larvae, and pelagic invertebrates could drift into close proximity to high energy noise sources (e.g. bow thrusters). However, any negative impacts that could occur would be restricted to within metres of the sound source. At such a localised extent, impacts would be negligible at an ecosystem or population level.

For impulsive noise and benthic invertebrates, the source is an important consideration in the assessment. Low frequency sources, such as the boomer SBP, can be considered for the purposes of this assessment in the context of scientific findings relevant to seismic surveys, with no other information available to suggest a more appropriate alternative. Therefore, for the boomer SBP, impulsive noise, the sound levels defined in Day et al. (2016) and Payne et al. (2008) are considered appropriate to guide an impact assessment (Table 6-9).

Table 6-9: Impulsive noise: sound levels relevant to invertebrates

Receptor	Sound levels
Invertebrates: effect at the seafloor (Day et al. 2016)	186–190 dB SEL 192–199 dB SEL_{24h} 209–212 dB PK-PK
Invertebrates: no effect at the seafloor (Payne et al. 2008)	202 dB PK-PK

Site specific modelling was not conducted against these thresholds for the proposed geophysical activities. However, the Beach Energy Otway Basin Geophysical Survey acoustic modelling, Wood and McPherson (2019), did undertake modelling. This work, as described above, was in similar water depths and geological environment, therefore the results can be used to conduct a high-level comparative assessment. The site-specific study in the Otway found that none of the sound levels listed in Table 6-9 were exceeded. This result is estimated to be appropriate for IMMR activities within the Reindeer operational area.

The infrequency and short duration of surveys during IMMR are expected to reduce the potential for impact on plankton and invertebrates. Any negative impacts that could occur would be restricted to within metres of the sound source. At such a localised extent, impacts would be negligible at an ecosystem or population level.

There are no thresholds or information available for the assessment of the potential impacts from high-frequency sources such as SSS or MBES on either water column or benthic invertebrates. These sources are often used to assess and quantify plankton densities, including within McCauley *et al*. (2017), who used a Simrad EK60 echosounder operating at 120 kHz

However, any negative impacts that could occur would be restricted to within metres of the sound source. At such a localised extent, impacts would be negligible at an ecosystem or population level.

6.1.2.7 Protected areas

The operational area is ~33 km away from the Montebello AMP (Multiple Use Zone – IUCN Category VI), the State Montebello Islands Marine Park and Barrow Island Marine Management Area. No recognised breeding or resting area for marine mammals, cetaceans, shark or fish species are known to occur in the operational area. However, it is overlapped by an internesting buffer for flatback turtles and habitat critical to the survival of the species BIAs for green, hawksbill and flatback turtles, pygmy blue whale distribution BIA, whale shark foraging BIA and a humpback whale migration BIA.

The Barrow Island MMA includes significant breeding and nesting areas for marine turtles and the waters support a diversity of tropical marine fauna, important coral reefs and unique mangrove communities (DEC 2007). Green, hawksbill and flatback turtles regularly use the island's beaches for breeding, and loggerhead turtles are also occasionally sighted. The operational area is 33 km away from the park boundary and hence noise impacts are not predicted to impact on birds or foraging and nesting turtles in the intertidal habitats closer to land. Numerous species are expected to be present within the area and impacts to these species are discussed above. Potential impacts to marine fauna within the MMA is not expected to result in significant displacement from critical habitat. It is also unlikely to present a barrier to movement or disrupt migratory pathways or behaviour.

6.1.3 Socio-economic

Impacts to fish may result in indirect impacts to fisheries in the operational area, with impacts restricted to moderate within hundreds of metres of the vessel as detailed above. With the majority of the noise emissions being of short duration and of limited extent, any impact on commercial or recreational fishing is expected to be minimal.

6.1.4 Environmental performance and control measures

The environmental performance outcome (EPO) relating to this event includes:

- No injury or mortality to EPBC Act and WA Biodiversity Conservation Act 2016 listed marine fauna during activities [EPO-RE-01].

The control measures considered for this event are shown in Table 6-10, and environmental performance standards (EPSs) and measurement criteria for the EPO are described in Table 8-2**.**

Table 6-10: Control measures evaluation for noise emissions to marine fauna

Control Measure Reference No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-01	Procedure for interacting with marine fauna.	Administrative	Reduces risk of physical and behavioural impacts to marine fauna from vessels, helicopters and UAVs because if they are sighted, then vessels can slow down, or move away, and helicopters and UAVs can increase distances from sighted fauna if required.	Operational costs to adhere to marine fauna interaction restrictions, such as vessel, helicopter and UAV speed and direction are based on legislated requirements and must be accepted.	Adopted – Benefits in reducing impacts to marine fauna outweigh the costs incurred by Santos.
RE-CM-02	Vessel planned maintenance system (PMS) to maintain vessel DP, engines and machinery.	Administrative	Ensures equipment which generates noise is operating optimally and sound sources levels are appropriately verified and within desired operating range.	Costs are standard for routine PMS	Adopted – Benefits in reducing noise impacts.
RE-CM-03	Bird Management Plan for Reindeer Offshore Platform (EA-00-RI-10191) implemented	Administrative	Reduces risk of impact to birds from helicopter strike through implementation of bird deterrent devices	Cost for procedure implementation, maintenance and management of bird deterrent devices and additional reporting.	Adopted **–** Benefits in reducing potential injury to birds outweigh the cost
RE-CM-04	Prestart Requirements (for survey equipment)	Administrative	Potential reduction in impact of noise to some sensitive receptors based on principles of the EPBC Policy Statement 2.1 – Part A.	Impracticable to schedule activities to avoid all listed marine fauna due to variability in timing of environmentally sensitive periods and the constant or unpredictable presence of some species. Short duration activity (i.e. a few days) that is low risk to marine fauna.	Adopted **–** Where practical (i.e. where equipment allows) as benefits in reducing potential impact to fauna from noise.

Control Measure Reference No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Additional Controls					
N/A	Dedicated Marine Fauna Observer on vessels (as per EPBC Policy Statement 2.1 – Part B.1)[1]	Protective	Improved ability to spot and identify marine fauna at risk of impact from vessel noise (that may cause harm).	Additional cost of contracting several specialist Marine Fauna Observers while the risk to all EPBC Act–listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species. Vessel masters are keeping watch for potential hazards.	Rejected – Cost disproportionate to increase in environmental benefit.
N/A	Structure activities to avoid coinciding with sensitive periods for marine fauna present in the operational area.	Administrative	Potential reduction in impact of noise to some sensitive receptors.	Impracticable to schedule activities to a limited time of the year as this would affect the maintenance program and integrity of the assets, leading to potential critical safety and environment impacts.	Rejected – Cost and residual safety risk is disproportionate to increase in environmental benefit.
N/A	Elimination of vessels.	Eliminate	May reduce the amount of noise emissions from vessels, although noise emissions to marine fauna due to vessel activities are expected to be negligible as the number of vessel activities required are minimal.	Elimination of support vessels from the field would not achieve Santos' legal requirements for petroleum production or its work-plan objectives for oil and gas production and may compromise safety standards for other marine users.	Rejected – Cost disproportionate to increase in environmental benefit.
N/A	Elimination of bird deterrent usage.	Eliminate	Would eliminate potential impacts associated with this intermittent noise source.	Limits the type of bird deterrent devices able to be used and potentially prohibits landings because the helideck integrity may be affected by bird guano and the landing of helicopters would be at risk of bird strike, which creates safety issues. Would also require mobilisation of personnel via vessel to the platform to clean the decks, introducing safety and health risks to personnel who would be required to climb the platform and would potentially inhale guano.	Rejected – Given the intermittent use and minimal risk of impacts to birds occurring, safety risk associated with personnel and helicopter use outweigh the environmental benefit.

6.1.5 Environmental impact assessment

Receptor	Consequence Level
Noise emissions	
Threatened, migratory, or local fauna	While the level of noise expected from temporary and intermittent activities has the potential to cause physical injury to marine fauna, most species that may transit through the area are expected to demonstrate avoidance behaviour if noise levels approach those that could cause pathological effects. Avoidance behaviour is likely to be localised (~4–5 km from the WHP/support vessels) within the area of the activity (due to small spatial extent of elevated noise) and temporary; i.e. for the duration of the activity only. The operational area overlaps a humpback whale migration BIA. Due to behavioural responses to noise within the operational area, humpback whales may be displaced from a small proportion of the BIA. However, the area overall represents a small proportion of the BIA width, which is unlikely to present a barrier to movement or disrupt migratory pathways or behaviour. In addition, a pygmy blue whale BIA for distribution overlaps the operational area, however displacement of pygmy blue whales is not expected. Potential PTS to low-frequency whales (such as humpback and pygmy blue whales) could occur within 12 m of the centre of a support vessel (considering a representative vessel) if the vessel and the cetacean remained in the same place for 24 hours. However, the vessel will never remain in one location for this long, and as whales are always moving and transiting through the area, the potential for impacts is extremely low. Short-term behavioural impacts from vessel and equipment noise may be expected for marine mammals, in particular humpback whales as they are likely to be transiting the area on migration. The National Recovery plan for the southern right whale also listed anthropogenic underwater noise from vessels as a potential threat to the southern right whale. As the southern right whale BIA lies approximately 240 km from the operational area, no impacts to southern right whales as a result of vessel noise are expected. In the Recovery Plan for Marine Turtles in Australia, noise interference to marine turtles is separated depending on whether the exposure is short (acute) or long-term (chronic). Activities such as pile driving, seismic activity and some forms of dredging generate acute noise, and sources of chronic noise are identified as including shipping channels and the operation of some oil and gas infrastructure. The level of noise generated by this activity is acute, temporary and may result in behavioural impacts to marine turtles. As the area within which foraging and distribution of all turtles species is widespread, the minimal disturbance is not expected to significantly impact the turtles within BIA or habitat critical or impact at a population level due to the nature and scale of the activity. Invertebrates could be directly affected by underwater noise generated during the activity. However, any negative impacts that could occur would be restricted to within metres of the sound source. At such a localised extent, impacts would be negligible at an ecosystem or population level. Given the generally low level of noise expected from the WHP, support vessels, helicopters, SSS and associated activities, and the relatively short duration of noise emissions, as well as the additional control to manage interaction with marine fauna (RE-CM-01) significant impacts to threatened or migratory species are not expected. Some temporary and localised behavioural response may result from the noise levels emitted, but these will not be at levels that could cause mortality or injury to marine fauna or cause a decrease in local population size or area of occupancy of species. Bird deterrent devices aim to produce avoidance behaviour in seabirds and are not expected to result in detrimental impacts to seabirds at population level. The consequence level for fauna is considered to be I – Negligible.
Physical environment or habitat	Not applicable – no impacts to physical environments and/or habitats from noise emissions are expected.
Threatened ecological communities	Not applicable – no threatened ecological communities are identified in the area over which noise emissions are expected.
Protected areas	Given the distance to the nearest protected area is 33 km, the consequence level for protected areas is considered to be I – Negligible.
Socio-economic receptors	Noise levels are not expected to impact on socio-economic receptors due to their low activity level within the vicinity of the operational area. However, given the short duration of the activity, limited impacts from the noise levels emitted from the activity, the area available for the respective commercial fisheries and the area over which commercial species spawn, impacts to fisheries are considered negligible. There are no recreation zones within the area expected to be impacted by noise.

	EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. The consequence level for socio-economic receptors is considered to be I – Negligible.
Overall worst-case consequence level	I – Negligible

6.1.6 Demonstration of ALARP

Elimination of support vessels from the field would not achieve Santos' legal requirements for petroleum production or its work-plan objectives for oil and gas production and may compromise safety standards for other marine users. Therefore, the elimination of vessels and vessel activities is not considered to be a practicable alternative on this basis. Equipment maintenance will keep the vessel noise levels to within normal operating limits, which will also aid in keeping noise emissions within the boundaries that have been risk assessed.

Reducing the frequency or size of support vessels is possible but would introduce disproportionate operational and safety risks; for example, the support vessel is required to be of sufficient size and power to be able to supply the necessities or services in an efficient and timely manner to maintain effective operation of the WHP and to provide support in an emergency, e.g. man overboard or fire incidents. Similarly, reducing or removing vessel and helicopter activities, particularly during known migration periods of marine fauna, is not a viable option as these activities are necessary for the safe and efficient operation of the facility, year-round. The deterrent device is required to be used regularly (such as daily) but intermittently and for a short duration, to deter birds from nesting on the platform.

Note also that most marine fauna affected in varying degrees by acoustic noise (i.e. cetaceans, turtles, sharks and fish) are all expected to avoid the source of noise. This avoidance is likely to be from a small area (due to the small spatial extent of required activities) and temporary, i.e. for the duration of the vessel activity only.

The support vessels are also expected to produce similar noise emissions to other marine vessels that frequent or transit through the vicinity of the operational area (i.e. oil and gas industry vessels). Management controls are in place to reduce operating noise including vessel, UAV and helicopter operational protocols, through adherence to the Santos Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which requires compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000, and includes controls to reduce the risk of disturbance or collision to EPBC listed marine fauna. Santos has considered the actions prescribed in the Recovery Plan for Marine Turtles in Australia (2017) when developing this control to minimise noise impacts on marine turtles.

Any behavioural impact caused by noise emissions is likely to be localised and temporary, with marine species expected to resume normal behavioural patterns in the open oceanic waters surrounding the operational area in a short time frame with no significant impact on their normal behaviour, including during sensitive periods such as migration, nesting or foraging.

Avoiding periods of higher sensitivity such as migration or nesting periods for whales and turtles (for example) is not considered feasible due to the ongoing nature of the activities. The operational area overlaps with a number of BIAs for fauna: humpback and pygmy blue whale migration that occurs across the NWS from April to December, and nesting activities for turtle species from August to April/May, this leaves a very small window of opportunity within which to conduct activities. Given the low potential impacts to individual fauna, there is not expected to be an impact at population level or significant impacts on migratory or nesting behaviours.

It is considered that there are no additional practicable risk reduction measures to those described that would not provide a grossly disproportionate benefit to the environment. It is therefore considered that the legislated and industry standard control measures identified for vessel movements, which Santos will implement, will reduce the impact and risk to ALARP.

6.1.7 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence from noise emissions is I- Negligible
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.

Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – IUCN principles of nearby reserves are met (Table 3-7). EPBC Regulations Part 8. Controls implemented will minimise the potential impacts from the activity to species identified in Recovery Plans as having the potential to be impacted by noise emissions. Relevant species Recovery Plans, Conservation Management Plans and management actions are listed in Table 3-10.
Are risks and impacts consistent with Santos' Environment, Health & Safety Policy?	Yes – Aligns with Santos' Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Minimal behavioural changes are expected from all marine fauna in the operational area, and therefore the negligible impacts expected from these noise sources are considered environmentally acceptable. No long-term harm is expected to result to EPBC listed marine fauna during operational and CoP activities. Through adherence to Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which requires compliance with Part 8 of the EPBC regulations (specifically Vessels and aircraft), the activity is considered acceptable to undertake in the area, in addition, no concerns from stakeholders (including fisheries) have been raised to indicate that the activities will have any unacceptable impacts to socio-economic receptors.

The activities that will generate noise are standard offshore industry practice and the potential impacts well documented. With the controls proposed including Part A of EPBC Act Policy Statement 2.1; EPBC Regulations Part 8 (Vessels and Aircraft) and aligned with the applicable management actions outlined in relevant Recovery Plans and Approved Conservation Advice, the potential consequences of impacts to noise sensitive receptors in the area, including internesting flatback turtles, are assessed to be I-Negligible and ALARP.

The Recovery Plan for Marine Turtles in Australia: 2017–2027 (DoEE 2017) highlights noise interference from anthropogenic activities as a threat to marine turtles. The plan refers to vessel noise and the operation of some oil and gas infrastructure as sources of chronic (continuous) noise in the marine environment, exposure of which may lead to avoidance of important turtle habitat.

It specifies the following priority action related to noise, for all marine turtle stock:

- Manage anthropogenic activities to ensure marine turtles are not displaced from identified habitat critical to the survival.

Support vessels will generate underwater noise. Under normal operating conditions when the vessel is idling or moving between sites, vessel noise would be detectable over a short distance. Higher noise levels occur when the vessel is using the dynamic position system to hold station, such as during transfer operations. Overall, underwater noise levels generated during the activity are expected to be localised, and below the thresholds for PTS and TTS.

Transiting marine turtles are expected to occur within the operational area during nesting and internesting periods. However, given the proposed management measures, it is reasonable to conclude that noise emissions will not affect the conservation status of marine turtles or compromise the objectives of the marine turtle recovery plan and therefore impacts are acceptable.

The operational area overlaps BIAs for humpback whales (migration) and pygmy blue whales (distribution). The Conservation Management Plan for the Blue Whale (DoE 2015) discusses marine seismic surveys and associated risk management measures, including implementing practical measures outlined in Part A of EPBC Act Policy Statement 2.1, however this is not relevant to this activity as SSS and MBES is associated with these activities and the use of these will be of a very short duration.

The controls proposed are consistent with relevant standards, including Part A of EPBC Act Policy Statement 2.1, EPBC Regulations Part 8 (Vessels and Aircraft), and aligned with the applicable management actions outlined in relevant Recovery Plans and Approved Conservation Advice. No concerns from stakeholders (including fisheries) have been raised regarding noise emissions during the activity. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. Therefore, the I – Negligible impacts expected from noise emissions are considered environmentally acceptable.

6.2 Light emissions

6.2.1 Description of event

Event	The WHP is a normally unmanned facility. Therefore, navigational lighting is permanently provided for safety and navigational purposes and consists of pulsating amber navigation lights. There is no lighting along the pipeline. No 'routine' night-time activities are planned. However, if required, maintenance and CoP related activities may need to be run at night for the purposes outlined in this EP. Night-time operations may be required whilst undertaking IMMR activities on the DC supply pipeline or WHP. While WHP visits are generally undertaken during daylight hours, a night-time visitation may be required. In all of these cases, lighting for safe work conditions and navigational purposes at night would be required at the location of the activity. Night operations on the WHP would be supported by portable lighting brought to the platform that can be run by the power supply on the platform (Section 2),or supplied by lighting found on the support vessel being used. Lighting for night-time activities, either on the WHP or on the support vessel, will typically consist of bright white (i.e. either sodium vapour, halogen or fluorescent) lights. An ROV will be used during the activity and it will require the use of spot lighting while it is underwater working. Lighting will typically consist of bright white (i.e. metal halide, halogen and fluorescent lights).
Extent	The light assessment boundary of 20 km from the source will be used as the extent of light exposure, in accordance with National Light Pollution Guidelines for Wildlife (Commonwealth of Australia 2023). The additional 20 km buffer around the operational area is the extent relevant to the impact assessment for planned light emissions. As this extends beyond the described area designated as the operational area (Section 2.1.2) for other planned activities; the values and sensitivities of these additional areas were identified using PMST reports (Appendix D). Appendix D identifies the species and BIAs identified within the buffer; and Table 3-7 identifies the BIAs intersected by the light assessment boundaries.
Duration	Artificial lighting is required 24 hours a day on the Reindeer WHP. Lighting may also be required 24 hours a day on support vessels if undertaking operational, IMMR and CoP activities during night-time periods. ROV activities are intermittent and of short duration.

6.2.2 Nature and scale of environmental impacts

<u>Potential receptors: Threatened, migratory or local fauna (marine mammals, marine turtles, sharks, rays, fish, and seabirds)</u>

Receptors that have important habitat present within a 20 km buffer of the operational area were considered as having potential for interaction, based on recommendations of the National Light Pollution Guidelines for Wildlife (DCCEEW, 2023). The 20 km threshold provides a precautionary limit based on observed effects of sky glow on marine turtle hatchlings (15–18 km) and fledgling seabirds grounded in response to artificial light 15 km away.

Artificial lighting has the potential to affect marine fauna that use visual cues for orientation, navigation, or other purposes, resulting in behavioural responses that can alter foraging and breeding activity in marine reptiles, seabirds, fish and zooplankton; create competitive advantage for some species; and reduce reproductive success and/or survival in others.

Potential impacts to marine fauna from artificial lighting are:

- Disorientation, attraction or repulsion
- Disruption to natural behavioural patterns and cycles.

These potential impacts depend on:

- Density and wavelength of the light and the extent to which light spills into areas that are significant for breeding and foraging
- Timing of overspill relative to breeding and foraging activity
- Resilience of the fauna populations that are affected.

The most sensitive environmental receptors to light emissions are marine turtles and seabirds.

Lighting from the WHP and support vessels that are on location may result in alterations to normal marine fauna behaviour, as discussed below for each fauna group. The combination of colour, intensity, closeness, direction and persistence of a light source are key factors in determining the magnitude of environmental impact (EPA, 2010).

Lighting from ROVs in the operational area may result in the localised aggregation of fish around the ROV. These aggregations of fish due to light are considered localised and temporary. These aggregations of fish, krill or plankton would be confined to a small area and would only occur when the ROV is in use. As such impacts from ROV use is not considered further.

6.2.2.1 Marine mammals

There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding or breeding behaviours of marine mammals. Marine mammals predominantly utilise acoustic senses to monitor their environment rather than visual sources (Simmonds et al. 2004), so light is not considered to be a significant factor in marine mammal behaviour or survival. The operational area overlaps with the migration BIA for humpback whale and the distribution BIA for pygmy blue whale. Light is not listed as a threat in the Blue Whale Conservation Management Plan 2015–2025 (2015), or the Conservation advice for fin or sei whales, and impact from light to these species are not anticipated.

6.2.2.2 Fish and plankton

Fish will likely not be affected by navigational lighting for mariners (Morandi et al 2018). However, other light emissions from the activity (such as deck lights for operational requirements) in the operational area may result in localised aggregation of fish in the immediate vicinity of the facility, support vessels and WHP. This may result in an increase in predation on prey species aggregating in the area, or exclusion of nocturnal foragers/predators from the area (Marchesan et al. 2005). Artificial light can also influence dial vertical migration patterns of plankton (including planktonic life stages of some fish species) in the surface waters and lead to migrations that occur outside of the optimal window for that species (Gibson et al. 2001, cited in Morandi 2018). The aggregation of plankton from light may result in the presence of whale sharks foraging as they are filter feeders, that primarily feed on plankton and zooplankton.

Overall, a short-term localised increase in fish activity is expected to occur as a result of lighting from the activity; however, with negligible impacts to the local fish population.

6.2.2.3 Seabirds

The operational area overlaps the breeding BIAs for the roseate tern, and the wedge-tailed shearwater and also includes the breeding BIA for fairy terns when a 20 km light buffer is applied. No key nesting, roosting or resting areas for this or any other species of bird are present within the operational area. However. In 2016/17, areas of potential wedge-tailed shearwater nesting habitat were recorded on Varanus Island (5.53 ha) and Airlie Island (12.47 ha) and surrounding islands of Bridled (2.94 ha), Serrurier (130.89 ha), Abutilon (2.02 ha) and Parakeelya (1.66 ha) (Astron 2017b).

The roseate tern, wedge-tailed shearwater and fairy tern (as listed as Sternula nereis in PMST BIAs) do not have a recovery plan or conservation advice. The Australian Fairy Tern (sub-species *Sternula nereis nereis*) has been listed as known to occur in the operational area. The Commonwealth Conservation Advice on *Sternula nereis nereis* (Australian Fairy Tern) (2011) suggests minimising night time lighting from oil and gas rigs near subspecies habitat to reduce night time feeding opportunities for Silver Gills and therefore discouraging competition with Fairy terns. Light has not been identified as a threat in the National Recovery Plan for the Australian Fairy tern (*Sternula nereis nereis*) (2020), however light pollution is listed as a threat in the Wildlife Conservation Plan for Seabirds (Commonwealth of Australia 2020).

The most vulnerable life stages for seabirds and migratory shorebirds are nesting adults or fledglings. Nesting or fledgling seabirds and migratory shorebirds are vulnerable to artificial lighting within 20 km of the nesting location (DCCEEW, 2023). For shearwater species, fledglings are predominantly impacted by onshore lighting sources, which can override sea finding cues and attract fledglings further inland, preventing them from reaching the sea (Mitkus et al. 2018; Telfer et al. 1987). Artificial light can also impact important behaviour of nesting adults (e.g. adult nest attendance, maintaining nest sites) or confuse shearwater species, resulting in injury or mortality as a result of birds colliding with structures (Cianchetti-Benedetti et al. 2018; Rodriguez et al. 2017).

In particular, wedge-tailed shearwaters are a nocturnally active species that breed on some of the islands of the Lowendals (including Varanus, Serrurier, and Bridled Island) and surrounding Barrow Island. They are frequently engaged in nocturnal flight in the waters surrounding the area between the months of August until April (Surman and Nicholson 2012). When the fledgling young leave their burrows at night during the austral autumn, they can become attracted and disoriented by bright artificial lights up to 20 km away (Nicholson 2002; DCCEEW, 2023).

As the activities will be conducted offshore and only for short durations at night (aside from navigational lighting) artificial light from the activities is not predicted to disrupt critical breeding behaviours within important nesting habitat, or displace seabirds from nesting habitat.

Seabirds are known to be attracted to artificial light from platforms or to potential food sources attracted to light (e.g. invertebrates, fish). However, due to the WHP being unmanned and therefore having only navigational lights present, the attraction would be more likely due to the aggregation of marine life at all trophic levels due to the presence of the structure, which creates food sources and shelter for seabirds (Surman, 2002).

6.2.2.4 Sea snakes

Sea snakes can occur in the vicinity of the WHP and may potentially be affected by artificial light sources. Due to the scarcity of information, the direct effect of artificial light on sea snakes is largely unknown. Sea snakes may experience indirect effects, such as changes in predator–prey relationships, and disorientation, attraction or repulsion may occur, although no data are currently available for further assessment.

6.2.2.5 Marine turtles

It is expected that turtles could be transient through the operational area given that it overlaps with the internesting buffer BIAs for flatback turtle and habitats critical for the flatback, green, and hawksbill turtles. If a 20 km light buffer is applied to the operational area (as per National Light Pollution Guidelines for Wildlife, DCCEEW 2023) it also overlaps internesting buffer BIAs for green, loggerhead and hawksbill turtles.

Marine turtles are particularly sensitive to artificial lighting, which is known to disrupt breeding adult turtles and post-emergent hatchlings (Limpus, 1971; Salmon & Wyneken, 1994; Limpus, 2007, 2008a, 2008b, 2009a, 2009b).

The Recovery Plan for Marine Turtles in Australia: 2017-2027 (Commonwealth of Australia, 2017) highlights artificial light as one of several threats to marine turtles. Specifically, the plan indicates that artificial light may reduce the overall reproductive output of a stock, and therefore recovery of the species, by:

- Inhibiting nesting by females
- Creating pools of light that attract swimming hatchlings and increase their risk of predation
- Disrupting hatchling orientation and sea-finding behaviour.

This disruption can occur because hatchlings orient themselves to the lowest-elevation light horizon and away from high silhouettes when moving from the nest to the sea. When the direction of the lowest-elevation light horizon is not clear, hatchlings move towards the brightest, lowest horizon (Limpus & Kamrowski, 2013).

Hatchlings

Therefore, while onshore lights (i.e. landward side of dunes) are of particular concern, offshore bright lights also have the potential to attract hatchlings, which have been shown to orient towards light sources close to the horizon (Witherington & Martin, 2003). This generally would not pose a problem if hatchlings are attracted directly to the surf zone, for once in the surf zone, turtle hatchlings are believed to be less influenced by light and to navigate using sea-wave and magnetic cues (Witherington & Martin, 2003). However, hatchlings may also orient along the beach, depending on the location of the light source relative to the beach. This can lead to fatigue, increase the hatchlings exposure to predators, and reduce the success of hatching turtles entering the ocean.

Once in the ocean, hatchlings are thought to remain close to the surface, orient by wave fronts and swim into deep offshore waters for several days to escape the more predator-filled shallow inshore waters. During this period, light spill from coastal port infrastructure and ships may 'entrap' hatchling swimming behaviour, reducing the success of their seaward dispersion and potentially increasing their exposure to predation via silhouetting (Salmon *et al.*, 1992).

There are no known nesting sites within the 20 km light buffer of the operational area with the nearest nesting beach (Rosemary Island) ~24km away, therefore it is unlikely that light emissions from the activity will be visible.

Lighting of support vessels can create pools of light that attract swimming hatchlings and increase their risk of predation (Commonwealth of Australia, 2017). Artificial light can therefore cause a gradual decline in the reproductive output of a nesting area, with changes not evident for decades because of the long life cycles involved (Commonwealth of Australia, 2017).

Nigh time activity will only be for short periods of time, though navigational lighting on the WHP is present 24/7, 365 days a year.

Any impacts to hatchling turtles from artificial light will be limited to possible short-term behavioural impacts that may result in a detectable but insignificant change to the local population.

Adults

As the operational area is a known aggregation area for adult turtles and intersects the internesting buffer turtle BIA for flatback turtles, some impacts may be expected, including behavioural responses. However, behavioural responses are not expected to significantly disturb long-distance movements, reproductive or feeding activities of turtles transiting the operational area.

The Recovery Plan for Marine Turtles in Australia: 2017-2027 specifies the following priority actions for the Pilbara genetic stock of flatback turtles in relation to artificial light:

- Artificial light within or adjacent to habitat critical to the survival of marine turtles will be managed such that marine turtles are not displaced from these habitats.

As the nearest nesting beach (Rosemary Island) is ~24km away it is unlikely that light emissions from the activity will be visible.

The potential impacts of light emissions to marine turtles from the activities are expected to be restricted to localised attraction and temporary disorientation. There will be no long term or residual impacts due to the activity being short-term. It is considered that the activity will not compromise the objectives as set out in the Recovery Plan for Marine Turtles and the impact of lighting associated with the activity to turtles is negligible.

6.2.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts to marine fauna from lighting on the WHP and vessels through limiting lighting to that required by safety and navigational lighting requirements. [EPO-RE-02].

Control measures considered and rejected for this activity regarding light emissions are described in Table 6-11.

Table 6-11: Control measures evaluation for light emissions

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-03	Bird Management Plan for Reindeer Offshore Platform (EA-00-RI-10191) implemented	Administrative	Reduces risk of impact to birds from laser bird deterrent system	Cost for procedure implementation, maintenance and management of bird deterrent devices and additional reporting.	Adopted – Benefits in reducing potential injury to birds outweigh the cost
RE-CM-05	Navigation lighting and aids	Administrative	Light spill from unnecessary lighting reduced, even further lowering likelihood of impacts to the environment.	Additional costs associated with implementing control.	Adopted – Cost is considered acceptable for the benefit that may be realised from this control.
RE-CM-06	Premobilisation review and planning of lighting on support vessels and the WHP is undertaken prior to IMMR activities commencing.	Administrative	Lighting is assessed to only provide necessary lighting for safety and navigation during the IMR activity, reducing the potential for additional light pollution to the environment.	Additional costs associated with implementing control.	Adopted – Cost is considered appropriate for the benefit that may be realised from this control.
Additional Control Measures					
N/A	Review lighting to replace with a type (colour) that has less potential to impact.	Substitute	Reduce potential for impacts on certain sensitive receptors from light emissions.	High cost to complete lighting change out on all vessels in area of low sensitivity. Navigational lighting colours are stipulated by law.	Rejected – Cost considered disproportionate compared to the incremental environmental benefit and is a legislative requirement.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
N/A	Limit or exclude night-time operations.	Eliminate	Reduce potential for impacts on certain sensitive receptors from light emissions during hours of darkness when light sources are more apparent and potential impacts are greatest.	Would double duration of activity; would increase impacts or potential impacts in other areas, including increase in waste, air emissions, and risk of vessel collision; and would be a navigational hindrance. The risk to all EPBC Act listed marine fauna cannot be reduced due to variability in timing of environmentally sensitive periods and unpredictable presence of some species.	Rejected – Given the minimal risk of impacts to EPBC Act listed marine species (e.g. turtles) occurring due to lighting, the financial and environmental costs incurred by requiring all works to be undertaken during daylight hours only (therefore disrupting activities) is unfeasible. Delay to IMMR works to daylight hours only could also pose a safety risk for any safety critical work which is unacceptable. Although the operational area overlaps with the internesting turtle BIA, impacts are not expected on a population level or on turtle habitat.
N/A	Select a bird deterrent device that does not include a light emitting component.	Eliminate	Would eliminate potential impacts associated with this intermittent light source during hours of darkness.	Limits the type of bird deterrent devices able to be used and potentially prohibits landings because the helideck integrity may be affected by bird guano, which creates safety issues.	Rejected – Given the intermittent use and minimal risk of impacts to birds occurring, the financial and environmental costs by limiting helicopter use to only daylight hours (thereby disrupting emergency response abilities) is unfeasible.
N/A	Manage the timing of the activity to avoid sensitive periods at the location (e.g. turtle nesting/ hatching).	Eliminate	Reduce risk of impacts from light emissions during environmentally sensitive periods for listed marine fauna (e.g. turtle nesting/ hatching).	The operational area is not located in an area that is likely to cause impact to turtle nesting or hatching and therefore timing the activity to avoid this would not change the potential environmental impacts.	Rejected – Given the minimal risk of impacts to listed marine species (e.g. turtles) occurring due to lighting, the financial and environmental costs of extending the activity duration are deemed grossly disproportionate to low environmental benefits.
N/A	Use of shrouding on external lights	Protective	Reduce potential for impacts on turtles from light emissions during hours of darkness when light sources are more apparent and potential impacts are greatest.	Cost associated with retro fitting external lighting with shrouding/shielding. Can only be done for lighting that does not impact on navigational requirements or safety.	Rejected- The financial and environmental costs of extending the activity duration are deemed grossly disproportionate to low environmental benefits.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
N/A	Use of dark, matt surfaces to reduce sky glow across all activities	Protective	Reduce potential for impacts on turtles from light emissions during hours of darkness when light sources are more apparent and potential impacts are greatest.	Additional cost to repaint vessel surfaces.	Rejected – Given the minimal risk of impacts to listed marine species (e.g. turtles) occurring due to lighting, the financial and environmental costs of extending the activity duration are deemed grossly disproportionate to low environmental benefits.

6.2.4 Environmental impact assessment

Receptor	Consequence Level
Light Emissions	
Threatened, migratory, or local fauna	Sensitive receptors that may be impacted by light emissions in the same location for an extended period of time include fish at the surface, marine turtles and seabirds. Light emissions may be visible to turtles transiting or internesting in surrounding areas including those present within the flatback turtle internesting buffer BIAs that intersect the operational area, but they are unlikely to affect nesting or hatchling sea-finding and dispersal activity. The Reindeer facilities are located a considerable distance from the closest known significant turtle nesting beaches. At the closest point, which would be a support vessel working on the DC supply pipeline at the State–Commonwealth waters boundary, the closest nesting beaches are Rosemary Island (in the Dampier Archipelago, ~24 km away) and Montebello, Barrow and Lowendal islands, ~69 km away) (Section 2.11). Therefore, night-time activity lighting from the support vessels is expected to have a negligible impact on breeding or hatchling turtles, given any maintenance activities are of relatively short duration too. In addition, permanent pulsating navigational lights or night-time activity lighting on the platform is not expected to have an impact as the WHP is 24 km away from the nearest significant nesting beach (Rosemary Island). Although the operational area overlaps with the internesting turtle BIA for flatback turtle, impacts are not expected on a population level or on turtle habitat. Cetaceans and marine mammals are not known to be significantly attracted to light sources at sea; therefore, disturbance to behaviour is unlikely. Indirect impacts on food sources or habitats also unlikely (see below). Fish, sharks and birds have been shown to be attracted to artificial light sources; however, the short duration of any maintenance activities on the WHP is unlikely to lead to large-scale changes in species abundance or distribution. Impacts to transient fish, sharks and seabirds will therefore be limited to short-term behavioural effects with no decrease in local population size or area of occupancy of species, loss or disruption of critical habitat, or disruption to the breeding cycle. The consequence level for fauna is considered to be I – Negligible.
Physical environment/habitat	Not applicable – No impacts to physical environments and/or habitats from light emissions are expected.
Threatened ecological communities	Not applicable – No threatened ecological communities identified in the area over which light emissions are expected.
Protected areas	Not applicable – No protected areas identified in the area over which light emissions are expected.
Socio-economic receptors	Not applicable – Lighting is not expected to cause an impact to socio- economic receptors other than to act as a visual cue for avoidance of the area by other marine users for safety purposes. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
Overall worst-case consequence level	I – Negligible

6.2.5 Demonstration of ALARP

Elimination of lighting for night-time activities is not considered practicable as activities on the WHP and DC supply pipeline are often undertaken within good weather windows, which means that sometimes it is essential to work at night. The alternative to working at night is spending longer periods at a location to achieve the operational objectives during daylight hours or mobilising over a number of good weather windows; this would be of no net environment benefit due to extra fuel use and increased presence at the location.

The potential to disorient or misorient turtles (nesting adults and hatchlings) through night-time lighting for 24-hour maintenance activities is considered unlikely as the closest that night-time activities may be required to occur from known turtle rookeries is on the DC supply pipeline at the State–Commonwealth waters boundary. This is located more than 20 km from the nearest known significant turtle rookeries (i.e. Rosemary Island). Therefore, the environmental risk to hatching turtles and nesting adults is considered negligible.

The activity will not compromise the objectives set out in the Recovery Plan for Marine Turtles in Australia (DoEE, 2017) as biologically important behaviours of nesting adults and emerging or dispersing hatchlings can continue given the distance of the activities from the nearest nesting beaches (24 km off Montebello Islands and from Dampier Archipelago). The light on the WHP is not expected to negatively impact individuals transecting the WHP operational area.

The assessed residual consequence for this impact is negligible and cannot be reduced further. Additional control measures were considered but rejected since the associated cost or effort was grossly disproportionate to any benefit, as detailed in Section 6.1.4. It is considered therefore that the impact of the activities conducted are acceptable and ALARP.

6.2.6 Acceptability evaluation

Is the consequence ranked as **I (Negligible) or II (Minor)?**	Yes – Maximum consequence from light emissions is I Negligible.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with International Convention of the Safety of Life at Sea (SOLAS) 1974 and the *Navigation Act 2012*. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10 and EPBC Act Policy Statement 3.21: Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Lighting on the WHP and vessels is industry standard and required to meet relevant maritime and safety regulations.

The potential consequences of the anthropogenic light sources in the operational area are considered to be insignificant in nature and restricted to short-term behavioural impacts on low numbers of individual fauna that may be present in the operational area.

Significant impacts are not expected on fauna, including nesting turtles or hatchlings. The separation of the light sources associated with the activity from nesting beaches is consistent with the relevant actions described in the Recovery Plan for Marine Turtles in Australia (CoA, 2017).

Although aggregation is known to occur within the operational area for flatback, loggerhead, hawksbill and green turtles, lighting from the Reindeer facilities and associated vessels is not expected to impact aggregating adults. Constant navigational lighting at the WHP is not likely to impact transient turtles. Turtles are more sensitive to light when feeding, mating or nesting or as hatchlings when transitioning from nest to ocean. Given the distance of the operational area from the shoreline, little to no effect is expected.

The event is consistent with the relevant actions described in the recovery plans listed above.

No impacts to marine park values are expected, and the level of lighting expected is not inconsistent with the values of the Montebello Australian Marine Park. No stakeholder concerns have been raised regarding lighting for the activity.

With the control measures in place, and compliance with navigational safety legislation, no significant impacts are expected. Therefore, the impacts of lighting to the receiving environment are ALARP and considered environmentally acceptable.

6.3 Atmospheric emissions

6.3.1 Description of event

Event	Greenhouse gas (GHG) emissions, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHGs, such as sulphur oxides (SO_x) and nitrogen oxides (NO_x), will be discharged to the atmosphere during operation of the WHP and during IMMR and CoP activities, contributing to a localised reduction in air quality. Atmospheric emissions from Reindeer WHP are derived from: • Two gas-powered microturbines for power generation • A diesel-powered deck crane • A diesel standby generator (automatically started upon loss of both microturbines). The volume of gases released from this equipment is not metered; the volume is calculated using the fuel gas and diesel usage as a proxy. A conversion factor is applied to this volume to convert it into tonnes of CO_2 equivalent. This factor is an accepted method used in annual reporting for the National Greenhouse and Energy Reporting Scheme. Note that NOx is not contained in the gas stream and is therefore not considered further in the assessment of atmospheric emissions from the WHP. Atmospheric emissions from vessels, helicopters and other equipment used during operations, IMMR and CoP are derived from: • Fuel use to power vessels, helicopters and equipment • Fuel for ancillary systems (e.g. crane) during IMMR • An incinerator to manage wastes; or • Ozone-depleting substances in closed-system rechargeable refrigeration systems. Air emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities. All vessels are required to comply with MARPOL air emissions regulations, by using low sulphur fuel (0.5%) and NOx emissions controls as applicable to engine age and type. Ozone-depleting substances are not used, generated or discharged by vessel activity other than what is incidentally located and used in closed systems on board vessels. Venting of: • Volatile organic compounds (VOCs) (primarily CH4) from drain systems on the platform, fugitive emissions from relief valves and sumps, and also their actuation • Pigging operations, process equipment maintenance, and well maintenance, servicing, suspension and abandonment; or • Fugitive emissions from the process control system. During cold venting, gas discharges are likely to contain methane, ethane, propane and carbon dioxide. The closed drain sumps separate the liquid from the gas in the inlet stream and then discharge the gas to atmosphere through a flame arrestor. Minor amounts of fugitive emissions are expected to occur on the WHP due to potential leak paths from the production equipment
Extent	Localised: The quantities of gaseous emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere.
Duration	Air emissions generated during the operational life of the field and during IMMR and CoP activities.

6.3.1.1 Atmospheric emissions from Reindeer WHP and DC supply pipeline

Atmospheric emissions from the Reindeer WHP and DC supply pipeline are outlined in Table 6-12 based on 2022/2023 emissions report under the *National Greenhouse and Energy Reporting Act 2027.*

Table 6-12: Scope 1 Atmospheric emissions from Reindeer WHP and DC supply pipeline 2022/2023

Source	Total tCO_2-e (Jul 2022-Jun 2023)
Fuel gas (microturbines)	848.4
Diesel	16.0
Fugitives	791.1

6.3.2 Nature and scale of environmental impacts

Potential receptors: Seabirds and humans

Hydrocarbon combustion may result in a temporary, localised reduction of air quality in the environment immediately surrounding the discharge point during the activity, which could affect seabirds and humans in the immediate vicinity. Potential impacts are expected to be short-term, and relate to localised reduction in air quality, limited to the immediate vicinity of the emissions release. Atmospheric emission impacts are not expected to have direct or cumulative impacts on sensitive environmental receptors or be above National Environmental Protection (Ambient Air Quality) measures.

6.3.2.1 Combustion emissions

The combustion emission of GHGs can lead to a reduction in local air quality and add to the national GHG loading, which could in turn contribute to climate change. Non-GHGs may be toxic, odoriferous or aesthetically unpleasing.

Air emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities. All vessels are required to comply with MARPOL air emissions regulations, by using low sulphur fuel (0.5%) and NOx emissions controls as applicable to engine age and type. The WHP crane and HPU as well as support vessels main engines and equipment such as pumps, cranes, winches, power packs and generators require MDO for fuel. The quantities of gaseous emissions are relatively small and will quickly dissipate into the surrounding offshore atmosphere. Due to the volumes and highly dispersive nature of the emissions no adverse impacts to seabirds or humans are expected.

As the activity will occur in open-ocean offshore waters, the combustion of fuels and in such remote locations will not impact on air quality in coastal towns, the nearest being Dampier (~80 km SSW). The quantities of gaseous emissions are relatively small Table 6-12 and will quickly dissipate into the surrounding atmosphere.

6.3.2.2 Ozone Depleting Substances

Accidental release and fugitive emissions of ODS has the potential to contribute to ozone layer depletion. Maintenance of refrigeration systems containing ODS is on a routine, but infrequent basis, and with controls implemented, the likelihood of an accidental ODS release of material volume is considered rare.

6.3.2.3 Cold venting and fugitive emissions

VOCs can be harmful to human health and also to the environment, as they can be toxic; however, this is generally for high concentrations of VOCs in closed environments. VOCs are not expected to be in large enough volumes to be harmful. The typically windy region will also dissipate and disseminate any VOCs, reducing their impacts.

The circumstances leading to cold venting include planned maintenance and pigging activities. These planned maintenance activities are scheduled to occur infrequently, at most bi-annually (e.g. pigging). The, of GHGs release are small, estimated as 0.8 tCO_2-e for each time the pig launcher is drained.

Minor amounts of fugitive emissions are expected to occur on the WHP due to potential leak paths from the production equipment. Hydrocarbon vapours, including VOCs, are released from storage tanks and equipment on filling of the diesel tanks and continuous minor venting, although emissions from storage tanks are expected to be minimal as the tanks themselves are very small (approximate tank size is 3.1 m^3). Air emissions will be similar to other facilities operating in the region for both petroleum and non-petroleum activities.

6.3.3 Environmental performance and control measure

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts to air and water quality from planned discharges and emissions from activities. [EPO-RE-03].

The control measures considered for this activity are shown in Table 6-13, and EPS and measurement criteria for the EPOs are described in Table 8-2.

Table 6-13: Control measures evaluation for atmospheric emissions

Control Measure Ref. No	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-02	Vessels planned maintenance system (PMS) to maintain	Administrative	Reduces emissions from vessels because equipment is	Operational costs and labour or access requirements of	Adopted – Benefits of operating equipment within operational parameters to help

Control Measure Ref. No	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
	vessel DP, engines, and machinery		operating within its parameters. Ensure vessel is running efficiently and are per manufacturer specifications. As such routine maintenance endeavours to ensure emissions are minimal.	undertaking vessels maintenance.	control emissions created by equipment outweighs the cost.
RE-CM-07	Facilities Planned Maintenance System.	Administrative	Reduces emissions from the WHP because equipment is operating within its parameters.	Operational costs and labour or access requirements of undertaking facility maintenance.	Adopted – Benefits of operating equipment within operational parameters to help control emissions created by equipment outweighs the cost.
RE-CM-08	Fuel Oil Quality.	Substitute	Reduces emissions through use of low-sulphur fuel in accordance with Marine Order 97.	Operational costs of refuelling.	Adopted – Environmental benefit outweighs cost, and it is a legislated requirement.
RE-CM-09	International Air Pollution Prevention Certificate	Administrative	Reduces probability of potential impacts to air quality due to ozone-depleting substance emissions and high NO_x and SO_x emissions.	Personnel cost of ensuring vessel has current IAPP certificate or equivalent during vessel contracting procedure and during premobilisation audits or inspections.	Adopted – Benefits of ensuring vessels are compliant outweighs the minimal cost of personnel time, and it is a legislated requirement.
RE-CM-10	Ozone-depleting Substance Handling Procedures.	Administrative	Reduces probability of potential impacts to air quality due to ozone-depleting substance emissions.	Personnel cost of maintaining ozone depleting substance record book or recording system.	Adopted – Benefit of ensuring no ozone depleting substance release outweighs the minimal cost.
RE-CM-11	Waste Incineration	Engineering	Reduces the potential for emissions or particulates by ensuring only permissible waste is incinerated as per Marine Order 97.	Personnel cost of maintaining waste records and training of staff.	Adopted – Benefit to air quality outweighs the costs and it is a legislated requirement.
Additional Control Measures					
N/A	No incineration during vessel-based operations activities.	Eliminate	Eliminate the potential for emissions due to waste incineration to	Increase in health risk from storage of wastes. Increase in risk due to transfers (increased fuel usage, potential	Rejected – Health and safety risks outweigh the benefit given the offshore location.

Control Measure Ref. No	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			impact air quality.	increase in collision risk, disposal on land).	Cost associated with transporting waste to shore for landfill and/or incineration outweighs costs of on-board incineration.
N/A	Removal of all ozone depleting substance containing equipment.	Eliminate	Eliminates potential of ozone depleting substance emissions occurring and impacting on air quality.	Lack of refrigeration systems on board the vessels would lead to unacceptable workplace conditions (i.e. air conditioning) and poor food hygiene standards, limiting the vessels' ability to undertake the activity. Therefore, there is no practicable alternative to the use of refrigeration. It is noted that ozone-depleting substances are rarely found on vessels.	Rejected – Based on cost to replace all equipment, and there is only a low potential for ozone-depleting substance releases.
N/A	Alternative fuel type (non-hydrocarbon based) selected for all vessels and helicopters.	Substitute	Could reduce level of pollutants released to the environment during fuel combustion.	Practicable and reliable alternative fuel types and power sources for the helicopters and support vessels have not been identified. If an alternative was available, vessels have fuel specification for equipment, and change of fuel may require further modifications to equipment.	Rejected – Not feasible.
N/A	Use incinerators and engines with higher environmental efficiency.	Substitute	Improves air quality by more efficient burning or fuel combustion.	Significant cost in changing unknown vessel equipment.	Rejected – Cost grossly disproportionate to low environmental benefit (impact rated negligible).
N/A	Use green energy sources on vessels	Substitution	Reduces the GHG emissions associated with the activity.	Significant additional cost associated with contracting vessels or changing out vessel equipment. Significantly restricts the number and types of vessels available to undertake the activities, with potential impacts to schedule and timing. Alternatives such as renewable energy generators (wind and/or sun) are not viable options as they	Rejected – Significant costs to Santos are grossly disproportionate to the negligible environmental benefit that may be gained.

Control Measure Ref. No	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
				are weather-dependent and do not supply continuous base load power. The vessels will use low sulphur marine diesel as required by MARPOL.	
N/A	Contain and re-inject gas to an export pipeline.	Engineering	Prevents cold venting.	Significant costs and effort in the augmentation of the facilities/processes on the WHP.	Rejected – The cost of implementing and maintaining these alternative controls are considered grossly dis-proportionate to the environmental benefits that they could provide given the platform location, the low volumes of gas to reclaim/flare and the infrequent releases.
N/A	Flaring of cold vented gases.	Engineering	Flaring would convert methane to carbon dioxide and minimise greenhouse gas risk.	Significant costs and effort in the augmentation of the facilities/processes on the WHP.	Rejected – The cost of implementing and maintaining these alternative controls are considered grossly disproportionate to the environmental benefits that they could provide given the platform location, the low volumes of gas to reclaim/flare and the infrequent releases.
N/A	No support vessels	Eliminate	Reduces the emissions and GHG associated with the activity.	The activity requires support vessels for crew and supplies and to provide emergency services. Alternative transfer of supplies via helicopter is not feasible due to the size of containers being transferred.	Rejected – Support vessels are required to undertake the activity and no alternatives are considered feasible.

6.3.4 Environmental impact assessment

Receptor	Consequence Level
Atmospheric Emissions	
Threatened, migratory, or local fauna	Emissions from the activity are relatively small and will, under normal circumstances quickly dissipate into the surrounding atmosphere. Short-term behavioural impacts to seabirds could be expected if they overfly the location; they may avoid the area. No decrease in local population size or area of occupancy of species, loss or disruption of critical habitat, disruption to the breeding cycle or introduction of disease. The consequence level for fauna is considered to be I – Negligible.

Receptor	Consequence Level
Atmospheric Emissions	
Physical environment or habitat	The activity will occur in the open ocean and offshore waters, the combustion of fuels and rare ODS releases in such a remote location will not impact on air quality in coastal towns. The quantities of gaseous emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere. The highly dispersive nature of local winds (i.e. strong and consistent) is expected to reduce potentially harmful or 'noticeable' gaseous concentrations within a short distance from the vessels. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. Therefore, the consequence level is assessed as I- Negligible.
Threatened ecological communities	Not applicable – No threatened ecological communities identified in the area over which atmospheric emissions are expected.
Protected areas	Potential impacts to fauna that contribute to marine park values addressed above. No impacts to other sensitive values identified in the Montebello Marine Park Management Plan (DNP, 2018). The consequence level for protected areas is considered to be I – Negligible.
Socio-economic receptors	As the activity occurs in offshore waters, the combustion of fuels, venting and ozone-depleting substance releases in the remote location will not impact on air quality of mainland human receptors. The quantities of gaseous emissions are relatively small and will, under normal circumstances, quickly dissipate into the surrounding atmosphere. The highly dispersive nature of local winds (i.e. strong and consistent) is expected to reduce potentially harmful or 'noticeable' gaseous concentrations within a short distance from the WHP and vessels and therefore not impact on other marine users in the vicinity and not influence local human receptors, such as Barrow Island, Dampier and Onslow. Air emissions will be similar to other vessels operating in the region for both petroleum and non-petroleum activities. Atmospheric emissions will add to the global inventory of GHGs; however, they and non-GHGs are not expected to have any local environmental consequences. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. The consequence level for socio-economic receptors is considered to be I – Negligible.
Overall worst-case consequence level	I – Negligible

6.3.5 Demonstration of ALARP

Air emissions are unavoidable during the production operation process on the WHP, as alternative power sources (such as solar or wind) to reduce emissions are not a guaranteed source. This would introduce a compromise of safety that would be disproportionate to the volume of emissions released.

There are no alternatives to combustion of fuels on support vessels to adequately maintain the WHP and DC supply pipeline. Emissions from support vessels during IMMR and CoP are unavoidable since supply trips and personnel transfers to the WHP are required for routine maintenance and to undertake any IMMR and CoP related activities. To date, there are no support vessels that offer any less environmentally harmful alternative fuel options. Where practicable, Santos will group activities into a single campaign to improve efficiency and reduce emissions, as well as to improve cost effectiveness of the activities, such as combining routine WHP visits with routine maintenance activities and WHP supply trips.

It is noted that the open drain system may capture unplanned spills of hydrocarbons, leading to some emissions; however, these are not considered cold venting activities and are captured as unplanned spills, described in Section 7 of the EP.

Santos has adopted best practice industry standards as the primary measures for reducing the extent and degree of air quality impacts to ALARP. This includes managing and maintaining all WHP production equipment in accordance with the CMMS designed for the WHP. Vessels and on-vessel combustion equipment will be maintained in accordance with the Contractor's planned maintenance system to ensure these are in good working order.

Maintenance, modification and inspection of the WHP, subsea infrastructure and DC supply pipeline are performed relatively infrequently. Further reducing the frequency of trips to the operational area may compromise the safe and efficient operating of the facility, which could increase the risk of greater environmental impacts (e.g. release of hydrocarbon to the marine environment).

The MARPOL standards and AMSA marine orders are considered to be the most appropriate standards for support vessels to adhere to in this environment, given the nature and scale of the activities, and they are widely used by the industry. These include regulations controlling the level of NO_x and SO_x from vessel engines. Compliance with these requirements together with implementation of the controls listed above reduces the environmental impacts associated with air emissions to ALARP. No objections or concerns were raised by relevant stakeholders.

Furthermore, the WHP and DC supply pipeline are located in oceanic waters where air emissions will disperse and rapidly assimilate in the North West Shelf air shed.

It is considered that there are no additional practicable risk reduction measures to those described that would not provide a grossly disproportionate benefit to the environment. Therefore, with the control measures listed in Section 6.3.3 in place, the risks and impacts from atmospheric emissions resulting from the activities are considered to be ALARP.

6.3.6 Acceptability evaluation

Is the consequence ranked as **I (Negligible) or II (Minor)?**	Yes – Maximum consequence from atmospheric emissions is I -Negligible).
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with Convention of the Safety of Life at Sea (SOLAS) 1974, *Navigation Act 2012, Marine Order* 97 (Marine pollution prevention- air pollution Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos' Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Atmospheric emissions from vessels are permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which is enacted in Australian waters by Marine Order 97 (Marine pollution prevention – air pollution) (which also reflects MARPOL Annex VI requirements). This is an internationally accepted standard that is utilised industry-wide, and compliance with MARPOL standards is considered to be an appropriate management measure in this case.

The overall impacts to the atmosphere and sensitive receptors are expected to be I- Negligible if the emissions management is adhered to and impacts from emissions that are generated by the various operational, IMMR and CoP activities are considered to be ALARP and environmentally acceptable.

6.4 Seabed and benthic habitat disturbance

6.4.1 Description of event

Event	Operational and CoP activities that have the potential to impact the seabed and benthic habitats within the operational area include : • Vessel anchoring (non-routine) • Cleaning of subsea infrastructure • Temporary subsea storage of equipment (e.g. work basket or clump weight) • Subsea maintenance and repair activities (e.g. diving, AUV survey activities, ROV operations, cutting, welding, pigging, installation, replacement or modification of subsea equipment, free span rectification and stabilisation, etc.) • Initial placement of equipment, deployment, retrieval or movement of equipment and ROV operations • Creation of artificial habitat because of the physical presence of infrastructure (and from currents altered by the presence of subsea infrastructure). • Seabed disturbance from environmental sampling as part of environmental monitoring (estimated to be up to 1 m² per sediment grab sample) This may result in minor seabed disturbance, sedimentation or water quality impacts (i.e. increased turbidity).
Extent	Localised**:** within the operational area.
Duration	During operations, IMMR and CoP activities.

6.4.2 Nature and scale of environmental impacts

Potential receptors: Benthic habitats and infauna,

Operational and CoP activities may disturb seabed and benthic habitat through:

- direct physical disturbance of an area of seabed habitat, including benthic fauna, of up to around 4 m² per basket placement, mats and supports on the seabed
- direct physical disturbance to the seabed, including benthic fauna during IMMR activities such as maintenance and repair activities
- indirect disturbance to benthic habitats and associated marine fauna by sedimentation
- direct physical disturbance to a localised area of seabed habitat from environmental sampling (estimated to be up to 1 m² per sediment grab sample)
- increased turbidity of the near-seabed water column.

6.4.2.1 Damage or loss of benthic habitat and biota

Previous surveys of the substrate (RPS, 2008) indicate that the seabed around the infrastructure is mostly soft sediments that support sparse benthic and epibenthic organisms, such as infauna (Section 2.11). Should the habitat be disturbed from any of the above-mentioned activities, the soft sediment communities will rapidly return to their pre-disturbance state due to the continuously moving nature of the seabed sediments, which act to fill depressions and other disturbed areas. Sediments are then expected to be recolonised by infauna and to regain ecological function.

Temporary or permanent direct loss of benthic habitat and associated biota may occur during maintenance, repair and intervention activities. During inspection or repair activities on the DC supply pipeline, vessel activities could include the placement of stabilisation mattresses, rocks or grout bags on the seabed or rock-bolting activities. During seabed sampling activities direct physical disturbance of an area of seabed habitat, including benthic fauna, of up to around 1 m² per grab sediment sample and temporary turbidity.

6.4.2.2 Turbidity and sedimentation

Direct physical disturbance of an area of seabed habitat, including benthic fauna, of up to around 4 m² per ROV basket placement on the seabed within the operational area could occur. During placement of equipment or infrastructure on the seabed (e.g. during IMMR) could result in:

- indirect disturbance to benthic habitats and associated marine fauna by sedimentation
- increased turbidity of the near-seabed water column.

Sensitive receptors identified in the operational area potentially impacted by IMMR and CoP related activities include soft sediments and benthic fauna.

Impacts may occur from direct disturbance to the seabed or from elevated turbidity in the water column, which has the potential for slight and short-term impacts to benthic fauna through clogging of respiratory and feeding parts of filter-feeding organisms.

Physical impacts to the seabed from the continued presence of seabed infrastructure may impact on sediment-burrowing infauna and surface epifauna invertebrates, particularly filter feeders. Impacts are expected to be intermittent with ocean currents and localised to the footprint and general vicinity around the infrastructure.

The operational area does not contain any significant or unique areas of benthic habitat. As described in Section 3.2.4, the benthic habitats within the operational area are primarily soft unconsolidated sediments.

Depressions on the seabed left by the placement of equipment are expected to infill as a result of movement of sediments by water currents and by the deposition of detrital matter. Given the nature of the habitat and associated benthic communities (Section 3.2.4), recolonisation would also be expected to be rapid.

Any temporary turbidity and sedimentation associated with the retrieval of wet-stored equipment, environmental sediment grab sampling, or IMMR activities is not considered likely to cause a significant environmental impact, given the high background levels of natural sediment movement in the area, the minor disturbance caused by the activity and the short duration of the activity.

Benthic habitats in the operational area are largely unconsolidated sediments with associated sparse assemblages of benthic and epibenthic organisms. This habitat type and associated biota are very widely represented in the region and not of conservation significance. The operational area is in ~30–61.3 m water depth and insufficient light reaches the seabed to support photosynthetic organisms such as zooxanthellate corals, seagrasses and macroalgae. Given the widespread representation of these communities and the localised and intermitted physical disturbance, negligible impacts are expected to occur as a result of the continued presence of seabed equipment in situ and IMMR activities.

6.4.2.3 Artificial habitat creation

The presence of subsea infrastructure has the potential to act as artificial habitat or hard substrate for the settlement of marine organisms that would not otherwise be successful in colonising the area. Over time, the colonisation of subsea infrastructure can lead to the development of a 'fouling' community, which subsequently provides predator or prey refuges, foraging resources for pelagic fish species, and artificial reefs potentially supporting fish aggregations (Gallaway et al., 1981).

The presence of seabed and fixed platform structures may result in a minor increase in diversity and abundance of reef-associated species, such as cods and snappers, which prefer habitat of structural complexity. Similarly, near-surface infrastructure can support pelagic species that are commonly attracted to fixed and drifting surface structures in areas of open ocean (Lindquist et al., 2005).

6.4.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Seabed disturbance is limited to planned activities and defined locations within the operational area [EPO-RE-04].

The control measures considered for this activity are shown in Table 6-14, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 6-14: Control measures evaluation for seabed and benthic habitat disturbance

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Preplanning of subsea and offshore maintenance activities reduces the risk of impacts to the seabed.	Personnel costs associated with preparation of planning documentation.	Adopted – The environmental benefits outweigh the costs of implementing measure.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
RE-CM-13	Anchoring and equipment deployment management.	Eliminate	Requires using existing Santos–approved anchor locations within the operational area, except in the case of an emergency, to prevent further seabed disturbance. Ensures all equipment deployed is recovered when activities are complete	No additional costs to Santos other than negligible personnel costs of reviewing information in an emergency situation.	Adopted – Benefits of using existing moorings prevents further disturbance.
Additional Control Measures					
N/A	Cessation of operations until all dropped objects are located and recovered.	Administrative	Would minimise potential for further disturbance due to dropped object potentially moving around on seabed causing further disturbance or long-term impacts.	Substantial additional cost to activities due to downtime over and above value of equipment lost. Little benefit given water depths and sparse distribution of sensitive benthic habitats in operational area.	Rejected – Cost outweighs the benefit.
N/A	Elimination of vessels or use of dynamic positioning for all vessels to avoid anchoring.	Eliminate	Reduces impacts to seabed from anchoring.	Given vast distances, inspections can be carried out in shorter time frames, reducing campaign lengths and other associated risks, thus, the use of vessels is a lower-risk and lower-cost option for surveys.	Rejected – Increased (transferred) risk disproportionate to environmental benefit.

6.4.4 Environmental impact assessment

Receptor	Consequence Level
Seabed and Benthic Habitat Disturbance	
Threatened, migratory, or local fauna	No sensitive seabed features are expected within the operational area based on surveys completed in the area (Section 2.11). Marine invertebrates may inhabit soft sediments and can contribute to the diet of some fauna, including flatback turtles. The area of soft sediment habitat that is potentially impacted is small compared to the amount of habitat available; therefore, the disturbance is not expected to affect prey availability; and therefore, impacts to protected flatback turtle species will be negligible. The consequence level for fauna is considered to be I – Negligible.
Physical environment or habitat	The area of physical environment and habitat that would be impacted during the event is typically soft unconsolidated sediments, is small compared to the area of similar habitat in the wider environment and is expected to re-establish following disturbance. As such, long-term or significant impacts to habitat values or ecosystem function are not expected. The impacts to the seabed from sampling, repair and maintenance activities would also be localised to the immediate sampling or repair location. No significant benthic habitats are known to exist in the corridor of the DC supply pipeline; therefore, it is not anticipated that any IMMR or sampling activities would have a significant effect on benthic communities (Section 3.2.4). The consequence level for physical environment or habitat is considered to be II – Minor.
Threatened ecological communities	Not applicable – No threatened ecological communities have been identified in the area over which seabed disturbance could occur.
Protected areas	Not applicable – No protected areas have been identified in the operational area where seabed disturbance could occur.

Receptor	Consequence Level
Seabed and Benthic Habitat Disturbance	
Socio-economic receptors	Disturbance of the seabed and benthic habitat within the operational area is highly unlikely to impact socio-economic receptors such as shipping and tourism. Any minor alteration or modification to habitats is not expected to impact commercial fisheries' target species based on the small size of disturbance relative to the available fishing grounds. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. No stakeholder concerns have been raised regarding this aspect. Therefore, impacts to socio-economic receptors are assessed as I (Negligible).
Overall worst-case consequence level	II – Minor

6.4.5 Demonstration of ALARP

Seabed disturbance from IMMR (including the placement of ROV baskets) cannot be eliminated. Anchoring is considered more reliable and a safer alternative than DP when undertaking activities adjacent to subsea assets in shallower waters. Elimination of planned IMMR activities may potentially result in more severe environmental impacts (e.g. a hydrocarbon spill due to DC supply pipeline leak) and compromising with the safety requirements from the approved safety case.

If anchoring of work vessels or sampling/disturbance of the seabed is required during planned sampling, maintenance and repair activities, the anchoring and mooring procedures during such activities will ensure the area disturbed is minimised and the risks and impacts are ALARP. A review of the most recent seabed survey indicates that there are no sensitive habitats in the vicinity of the WHP and DC supply pipeline, and the habitat type present is well represented habitat that will recover should a disturbance occur.

No objections or concerns were raised by relevant stakeholders regarding the activity.

All practicable control measures have been reviewed (Section 6.4.3) and those adopted are considered appropriate to manage the impacts such that the residual consequence is assessed to be minor and cannot be reduced further. The proposed management controls for seabed disturbance are in accordance with Santos' risk management criteria and are considered appropriate to manage the risk to ALARP.

6.4.6 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence from seabed and benthic habitat disturbance is II- Minor.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – No plans identified seabed disturbance like those described above as being a threat to marine fauna or habitats.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

WHP operations and CoP activities will result in some level of seabed disturbance; however, with consideration of the control measures in place, based on Santos' consequence matrix (Table 5-4), the worst impact is assessed as 'Minor'.

The Activity is consistent with the relevant actions described in the Recovery Plans listed above.

No impacts to other Marine Park values are expected. No stakeholder concerns have been raised regarding the activity.

The potential consequence of seabed disturbance on receptors is assessed as II-Minor. With the control measures in place, including compliance with industry standards and legislation, no significant impacts are expected. The impacts of seabed disturbance to the receiving environment are ALARP and considered environmentally acceptable.

6.5 Interaction with other marine users

6.5.1 Description of event

Event	Operations, IMMR and CoP phase related activities have the potential to interact with other marine users. Support vessels will be regularly transiting the area and, at times of maintenance, inspection and repair, may need to operate 24 hours a day. The presence of vessels in the operational area could potentially inhibit marine user groups, tourism, commercial shipping, fishing and other oil and gas activities.
Extent	Localised within the operational area.
Duration	Temporary and intermittent interaction with vessels when transiting the operational area and undertaking IMMR and CoP activities along the DC supply pipeline route. Permanent exclusion of other marine users within the 500 m-radius petroleum safety zone (under Section 6 of the OPGGS Act) of the WHP for the operational life of the field.

6.5.2 Nature and scale of environmental impacts

<u>Potential receptors: Socio-economic (commercial fishers and fisheries, recreational fishers, tourism, commercial shipping and petroleum activity)</u>

The presence of the WHP with its 500 m-radius petroleum safety zone, the 2.5 nm-radius cautionary zone, and the movements of support vessels has the potential to interact with commercial or recreational fisheries by reducing available fishing areas due to displacement.

Santos has identified the following stakeholders as potential marine users of the operational area; commercial fishers, recreational fishers, commercial shipping, and other petroleum-related vessels. These users maybe temporarily displaced by the physical presence of the WHP and support vessels.

6.5.2.1 Commercial fishers

Commercial fishers have been identified as relevant stakeholders and are considered to be the main marine user within the operational area. There are a number of commercial fisheries that overlap the operational area (See Section 3.2.7.1. These are summarised in Table 3-11.

An analysis of the historical fishing effort data, current fishery closures, depth range of activity, fishing methods and consultation feedback has revealed that there is a low potential for interaction with commercial fisheries. None of the Commonwealth fisheries identified in Section 3.2.7.1 are likely to be significantly active in the operational area as there has been no active commercial fishing within the operational area in the past few years Consultation confirmed that no recent fishing has occurred in the operational area and no concerns were raised by other marine users. However, fisheries overlap the EMBA, and therefore fishing vessels could be encountered in low density. For state managed fisheries the 2013–2023 FishCube data (DPIRD 2023) indicated:

- The Mackerel Managed Fishery has had recent fishing activity with a recordable catch effort recorded and a vessel count of three or less vessels within the operational area.
- The Pilbara Demersal Scalefish Fisheries (includes trap and trawl fisheries) identified the Trawl Fishery as being active in data blocks that overlap the operational area within the last ten years. The operational area overlaps both open and prohibited fishing areas for this fishery and the data indicates that the fishery had catch effort recorded and a vessel count of six or less vessels within the operational area.
- Marine Aquarium Fish Managed Fishery has recorded less than three active vessels within the operational area and activities are unlikely due to the depth and the dive-based method of collection.
- The Pearl Oyster Managed Fishery, Onslow Prawn Limited Entry Fishery, Pilbara Crab Managed Fishery, Abalone Managed Fishery all centre on much shallower inshore waters and therefore vessel presence is unlikely in the operational area.
- No activity from the Pilbara Line Fishery has been recorded in the operational area.

Due to the low level of fishing effort within the operational area displacement of fisheries will be negligible. Indigenous subsistence fishing and traditional hunting may occur in waters close to shorelines, outside of the operational area and therefore interactions with the WHP, DC supply pipeline and support vessels are not expected. Consultation with First Nations Peoples has raised no concerns about the proposed activities.

6.5.2.2 Recreational fishers and tourism

There are various charter fishing companies that operate out of Dampier, fishing may occur at the Montebello Islands and Barrow Island but is not expected in the operational area.

Recreational activities such as snorkelling, diving, surfing and fishing activities are more likely to occur in shallow waters around the Dampier Archipelago and off the Dampier coast, however interaction with these activities and the WHP, DC supply pipeline and support vessels are unlikely to occur. As such, impacts to recreational activities and tourism are not expected.

6.5.2.3 Commercial shipping

The presence of the support vessels associated with the DC supply pipeline and WHP could impact commercial shipping. One major shipping route crosses the DC supply pipeline in Commonwealth waters (Figure 3-18).

Vessel traffic is largely confined to the two designated shipping fairways servicing Port Hedland. Other vessels within the area are commonly proceeding to and from other major ports in the area (ports of Dampier, Port Walcott, Port Hedland, Barrow Island, Varanus Island and Onslow). Should commercial vessels need to deviate from planned routes to avoid the activity vessels, this may slightly increase transit times and fuel consumption.

6.5.2.4 Oil and gas activities

The NWS is a major oil and gas hub in Australia, with several companies operating within the area. Within the operational area the Pluto gas export pipeline transects the DC supply pipeline ~21 km south of the Reindeer WHP. There are a number of Santos facilities within close proximity to the operational area.

6.5.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts on other marine users through the provision of information to relevant stakeholders such that they are able to plan for their activities and avoid unexpected interference. [EPO-RE-05]

The control measures considered for this activity are shown in Table 6-15, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 6-15: Control measures evaluation for interaction with other marine users

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-05	Lighting will be used as required for safe work conditions and navigational purposes	Engineering	Ensures the vessels are seen by other marine users. Reduces the risk of collisions with other marine users.	Negligible costs of acquiring and operating navigation equipment, as required by maritime law.	Adopted – The safety benefits of having navigation equipment and procedures outweighs any cost. It is a maritime requirement.
RE-CM-14	Existing (gazetted) PSZ established around the WHP location	Isolation	Gazetted 500 m PSZ around the WHP prevents vessels from getting too close and causing damage to equipment of either party.	No additional costs to Santos. Other marine users may be temporarily excluded from areas, disrupting their activities.	Adopted – Benefits considered to outweigh costs.
RE-CM-15	Navigational charts	Administrative	Ensure other marine users are aware of the presence of the WHP, DC supply pipeline and subsea infrastructure.	No additional costs to Santos. Other marine users may be temporarily excluded from areas, disrupting their activities.	Adopted – Benefits considered to outweigh costs.
RE-CM-16	Seafarer Certification.	Administrative	Requires appropriately trained and competent personnel, in accordance with Marine Order 70, to navigate vessels to reduce interaction with other marine users.	Costs associated with personnel time in obtaining qualifications.	Adopted **–** Benefits considered to outweigh costs, and it is a legislated requirement.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
RE-CM-17	Identification system	Engineering	Vessels have an Automatic Identification System to aid in their detection at sea.	Negligible costs of operating navigational equipment. Standard equipment on vessels.	Adopted – Benefits outweigh negligible costs to Santos.
RE-CM-18	Constant bridge watch	Eliminate	Monitoring of surrounding marine environment to identify potential collision risks with other marine users.	No additional cost – industry practice and regulated by AMSA.	Adopted – Industry practice, benefits outweigh cost.
RE-CM-19	Maritime notices	Administrative	Ensures that the other marine users are aware of the presence of the vessels	Cost associated with the personnel time in issuing notifications and closing out queries and responses.	Adopted- benefits outweigh negligible costs. Maritime requirement to issue maritime notices.
RE-CM-20	Santos' stakeholder consultation strategy	Administrative	Santos will notify all relevant stakeholders listed, , in Table 8-4 of details prior to commencement of CoP campaigns, including activity timing, vessel movements, proposed cessation date and vessel details. Ensures other marine users, such as commercial fishers, are aware of upcoming operations so they can plan their business accordingly.	Limited additional costs to Santos. Stakeholders time required to review consultation material and communicate with Santos.	Adopted – Benefits considered to outweigh Costs to Santos. Important control to ensure other marine users are aware of upcoming operations and potential business disruptions
RE-CM-21	Safety Exclusion Zone established around vessels during work on the pipeline to reduce potential for collision or interference with other marine user activities	Isolation	Reduce potential impacts to fisheries in the vicinity of the activity	No additional costs to Santos. Other marine users may be temporarily excluded from areas, disrupting their activities.	Adopted – Benefits considered to outweigh costs.
RE-CM-22	Vessel personnel inductions	Administrative	Reinforcing the importance of marine communications in the event of any potential interactions with active commercial fishers will minimise project potential to displace other marine users.	Negligible, given it is a standard industry practice.	Adopted – Benefits outweigh negligible costs.
RE-CM-23	No fishing from support vessels.	Eliminate	Reduce potential impacts to fisheries in the vicinity of the activity. Personnel are prohibited from recreational fishing activities support vessels.	Negligible costs.	Adopted – Benefits considered to outweigh negligible costs to Santos.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Additional Control Measures					
N/A	Manage the timing of the activities to avoid peak marine user periods (e.g. fishing).	Eliminate	Would eliminate potential impacts to other marine users.	Not considered feasible as marine users could potentially be in the area all year round and activities are required all year round. The area that other marine users are excluded from is small when compared to the area available to other marine users, and there is low fishing activity in the area as evidenced through consultation.	Rejected – Stakeholders in the area all year round.

6.5.4 Environmental impact assessment

Receptor	Consequence Level
Interaction with Other Users	
Threatened, migratory, or local fauna	Not applicable – related to socio-economic receptors only.
Physical environment or habitat	
Threatened ecological communities	
Protected areas	
Socio-economic receptors	Given that the WHP has been operational since 2011 and that shipping vessels have been required to deviate slightly around it since construction began in 2010, the impacts to shipping are considered to be negligible due to the small area affected in comparison to the area available for vessels to navigate through. The impact from the DC supply pipeline is also considered to be negligible due to the small area affected in comparison to the area available for vessels to navigate through and the infrequent visits required for DC supply pipeline maintenance visits (approximately less than once a year (Section 2.9.8)). FishCube data (2013-2023) shows low level fishing effort in the operational area for the Mackerel Managed Fishery and Pilbara Trawl Fishery, however the operational area is not likely to be used for commercial fishing as it does not represent important habitat for targeted commercial species. A lack of natural seabed features (e.g. rocky or coral reef) beneath the WHP indicates that recreational fishing is also unlikely to occur. The open waters in the vicinity of the WHP and DC supply pipeline do not support significant recreational or tourist activity therefore, impact to recreational fisheries or tourism is not expected. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. The consequence level for socio-economic receptors is considered to be I – Negligible.
Overall worst-case consequence level	I – Negligible

6.5.5 Demonstration of ALARP

Vessels are required for the activities described in this EP. The presence of subsea infrastructure in offshore fields is normal industry practice. The management of activities relating to interactions with other marine users is well established, understood and regulated. Given the offshore location, recreational and tourism activities are not expected to occur in the area. Impacts to commercial fishing activities are not expected, given the lack of fishing effort in the area. Impacts to commercial shipping movements are expected to be minimal.

No objections or concerns were raised by relevant stakeholders regarding the activity.

Stakeholders have been informed of the proposed CoP activity. Ongoing consultation, along with Notice to Mariners issued via notifications to Australian Hydrographic Service before commencing in-field campaigns minimise the risk of interference with other marine users.

With the controls adopted, the assessed residual consequence for this impact is negligible and cannot be reduced further. Additional control measures were considered but rejected since the associated cost or effort was grossly disproportionate to any benefit. Therefore, it is considered that the impact is ALARP.

6.5.6 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence is I -Negligible.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with the International Convention for the *Safety of Life at Sea (SOLAS) 1974* and *Navigation Act 2012*.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The presence of the vessels and subsea infrastructure and undertaking Operations, IMMR and CoP phase related activities is not expected to significantly affect other marine users, including commercial fishing operations or shipping traffic, given the:

- small existing (gazetted) PSZs established around the Reindeer WHP in relation to the wider areas for shipping transit and navigation
- short duration of IMMR and CoP activities
- outcomes of stakeholder engagement did not identify any concerns by relevant stakeholders.

The impacts of interaction with other users is ALARP and considered acceptable.

6.6 Planned Operational discharges

6.6.1 Description of event

Event	Potential impacts may occur in the operational area from vessel activities undertaking operations support, IMMR and CoP activities. Planned discharges and wastes are summarised below: Operational area: • sewage and grey water • food wastes • deck drainage • cooling water • bilge water • brine • ballast water • guano washdown water Sewage and grey water A flushing toilet and hand wash basins have been provided for personnel when visiting the WHP (Section 2). These discharge directly overboard into the ocean. No kitchen facilities are available on the WHP; therefore, no kitchen grey water (e.g. dishwater) or putrescible waste will be produced from the WHP. The volumes of sewage and washwater discharge are expected to be minimal from the WHP as it is an unmanned platform that is visited once every two months by two to four people (maximum of ten people) (Section 2). The volume of sewage and grey water discharged from vessels is directly proportionate to the number of persons on-board the vessels. Up to 30–40 L of sewage / greywater will be generated per person per day. Treated sewage will be disposed in accordance with Marine Order 96 (Marine pollution prevention – sewage) requirements. Food waste Putrescible waste is estimated to consist of around 1 L of food waste per person per day. Putrescible waste will be disposed in accordance with Marine Order 95 (Marine pollution prevention – garbage) requirements. Deck drainage Drainage water on offshore facilities and vessels consists of rainwater and seawater spray and may potentially contain small residual quantities of oil, grease and detergents, if present or used on the decks. However, controls are in place to prevent, contain and clean up such spills. Rainwater, wash-down water and any spillages from bunded deck areas on vessels may potentially discharge into the ocean. Rainwater, wash-down water and any spillages from bunded deck areas are collected by the WHP atmospheric drain system, which drains to the atmospheric sump tank built into the cellar deck. During heavy rainfall events, the system is designed to separate hydrocarbons from the water and allow the separated water to discharge, storing the hydrocarbons, which will then be pumped back into the production header. The system is designed so that water is preferentially discharged over hydrocarbons (Section 2.7.3). Hydrocarbons are separated in the atmospheric drain system; however, both are pumped back into the production line under normal operations. This water may contain trace quantities of contaminants from the deck surface, such as detergents, oil and grease. Vessel cooling water Seawater may be used by some vessels as a heat exchange medium for the cooling of machinery engines. Seawater is drawn from the ocean and flows counter current through closed-circuit heat exchangers, transferring heat from the vessel engines and machinery to the seawater. The seawater is then discharged to the ocean (i.e. it is a once-through system). Cooling water temperatures may vary depending on the vessel's engines' workload and activity. Bilge water While in the operational area, the vessels may discharge oily water after treatment to 15 ppm via a MARPOL-approved oily water filter system. Bilge water will be disposed in accordance with Marine Order 91 (Marine pollution prevention – oil, as appropriate to class) requirements or is collected and stored for discharge onshore. Brine Brine generated from the water supply systems on board the vessels will be discharged to the ocean at a salinity of around 10% higher than seawater. The volume of the discharge depends on the requirement for fresh (or potable) water and will vary between the vessels and the number of people on board. The effluent may contain scale that control inorganic scale formation, such as the formation of calcium carbonate and magnesium hydroxide, in water-making plants. Other water purification chemicals such as chlorine may also be added to the potable water. Other water-making plant cleaning chemicals may be used and discharged to sea after completion of the cleaning process. Vessel ballast water

	Ballast water could potentially be discharged to the marine environment from vessel ballast tanks. This is further discussed in Section 7.1. Guano washdown waters Guano is water blasted (using seawater) off the platform as required to maintain the helideck for safe helicopter landing. The guano and water are discharged directly to sea.
Extent	Localised: The small volumes of non-hazardous discharges may cause localised nutrient enrichment, organic and particulate loading, toxic impacts to marine fauna, thermal impacts and increased salinity in waters around discharge points and in the direction of the prevailing current. The environment that may be affected by operational discharges will likely be contained within the operational area and is predicted to be restricted to within around 100 m of the discharge point in the upper 5 m of the water column.
Duration	During the life of the activity and during IMMR and CoP activities.

6.6.2 Nature and scale of potential environmental impacts

Potential receptors: Water quality, fish (pelagic) and sharks, marine mammals, marine turtles, seabirds, and cultural receptors (totemic species).

6.6.2.1 Physical environment

The discharge of small volumes of non-hazardous wastes to the marine environment will result in a localised reduction in water quality. Discharges will be temporary (minutes to hours), localised and limited to surface waters (less than 5 m depth). The discharges are expected to be dispersed and diluted rapidly, with concentrations of wastes significantly dropping with distance from the discharge point. Changes to ambient water quality outside of the operational area are considered unlikely to occur.

Specifics of potential impacts to water quality from the discharge of operational discharges are as follows:

Eutrophication impacts from sewage, grey water, deck drainage, guano washdown and putrescible (food) wastes

Discharge of food waste, treated sewage (from vessels), untreated sewage from the WHP and grey water as well as guano washdown water can result in localised increases in nutrient concentrations (e.g. ammonia, nitrite, nitrate and orthophosphate), organics (e.g. volatile and semi volatile organic compounds, oil and grease, phenols and endocrine-disrupting compounds) and inorganics (e.g. hydrogen sulphide, metals and metalloids, surfactants, phthalates and residual chlorine). Increased biological oxygen demand on the receiving waters may promote localised elevated levels of phytoplankton due to nutrient inputs and bacteria activity due to organic carbon inputs. This could subsequently impact higher order predators.

However, dispersion and dilution of discharges is expected to be rapid, as the discharges are of low volume. The discharges are subject to biodegradation of organics through bacterial action, oxidation and evaporation, and the operational area is located in deep offshore waters dominated by high currents, resulting in short-term changes to surface water quality within the operational area.

In a study of sewage discharge in deep ocean waters, Friligos (1985) reported no appreciable differences in the inorganic nutrient levels between the outfall area and background concentrations suggesting rapid uptake of nutrients and / or rapid dispersion in the surrounding waters. Similar studies (Parnell, 2003) concluded similar results with rapid dispersion and dilution within hours of discharge.

The discharge of sewage, deck drainage, grey water, guano washdown water and putrescible wastes is not expected to contact any offshore reefs, islands, shoals or banks or marine parks.

Changes in temperature

Cooling water will be discharged from vessels at a temperature above ambient seawater temperature. Upon discharge it will be subjected to turbulent mixing and transfer of heat to the surrounding waters.

Temperature dispersion modelling shows that the water temperature of discharged water will decrease rapidly as the discharge mixes with the receiving waters, with discharged waters being <1 °C above background levels within less than 100 m (horizontally) of the discharge point. Vertically, the discharge will be within background levels within 10 m (Woodside, 2011).

Cooling water discharge points vary for each vessel. However, they all adopt the same discharge design, which permits cooling water to be discharged above the water line to facilitate cooling and oxygenation of this wastewater stream before mixing with the surrounding marine environment.

Cooling water discharge to the marine environment could result in a localised and temporary increase in the ambient water temperature. This may cause alteration of the physiological processes (particularly enzyme-mediated processes) in marine biota. Given the relatively low volume of cooling water, the low temperature differential, and the open water surrounding the vessels, impact on water quality is expected to be low and short term.

The cooling water discharge is not expected to contact any offshore reefs, islands, shoals or banks, or marine parks.

Contamination from releases of bilge water

Discharges of oily bilge water from vessels could result in a localised reduction in water quality with impacts on protected marine fauna and plankton. However, oily water discharged from the vessels will be treated to a concentration of less than 15 ppm before release, in accordance with the requirements of Marine Order 91 (Marine pollution prevention – oil), which will unlikely lead to any impacts to the receiving environment. The concentration and dosage within surface waters is expected to be very low and toxic impacts to water quality and benthic habitats would be on a negligible scale.

Salinity increases

The desalination of seawater on vessels results in a discharge of brine with a slightly elevated salinity (around 10% higher than seawater). On discharge to the sea, the desalination brine, being of greater density than seawater, is expected to sink and disperse in the currents. On average, seawater has a salt concentration of 35,000 ppm. The volume of the discharge depends on the requirement for fresh (or potable) water and the number of people on board.

Most marine species are able to tolerate short-term fluctuations in salinity in the order of 20% to 30% (Walker and McComb, 1990), and it is expected that most pelagic species would be able to tolerate short-term exposure to the slight increase in salinity caused by the discharged brine.

Given the relatively low volume of discharge, low salinity increase and deep, open water surrounding the vessels, impact on water quality in the operational area is expected to be low.

The brine discharge is not expected to contact any offshore reefs, islands, shoals or banks or marine parks.

Toxicity

Discharges from vessel systems may include chemicals within sewage systems, ballast systems, greywater, desalination and residues of those used for cleaning decks.

On discharge to the marine environment, the low volumes of these types of chemicals are expected to rapidly disperse in the offshore marine environment. Hence, any potential impacts would be confined to a localised area immediately surrounding the discharge.

There may be a localised and temporary (hours) reduction in water quality in the immediate vicinity of the release. Toxicity impacts to marine fauna from the release of chemicals are unlikely to eventuate because:

- strong ocean currents result in the discharge being further diluted upon release to the marine environment, so the duration of exposure of chemicals to fauna will be minimal
- deck cleaning products planned to be released to sea will meet the criteria for not being harmful to the marine environment according to MARPOL Annex V
- other products with potential to be released to the sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V; or Gold/Silver/D or E rated through OCNS; or have a completed Santos ecotoxicological risk assessment so only environmentally acceptable products are used
- potential discharges will be intermittent and temporary within the operational area.

6.6.2.2 Impacts to threatened or migratory fauna

As discussed in the sections above, the discharge extent for all planned discharges is localised, and rapid dilution is predicted to occur within the offshore waters. Marine fauna within the operational area are likely to be transient. The operational area overlaps with the whale shark foraging BIA, pygmy blue whale distribution and humpback whale migration BIA, roseate tern and wedge-tailed shearwater breeding BIAs, therefore these species are more likely to be encountered in the operational area. However, if contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and the transient fauna movement, such that any exposure is likely not of sufficient duration to cause a toxic effect. Impacts to critical habitat identified for turtles that overlaps the operational area will not be significantly modified or affected by these operational discharges due to the rapid dilution and dissipation in the open ocean waters.

Discharges may cause changes to behaviour in marine fauna (avoidance or attraction). Fishes and oceanic seabirds may be attracted to the discharge of food scraps. However, such discharges would be isolated occurrences and not in any one location, so no prolonged influence on faunal behaviour is expected. Discharges of cooling water and brine may cause avoidance behaviour in marine fauna. Given the nature of the discharges (localised, rapid dilution, intermittent), any behavioural impacts are expected to be short term and minimal.

Given the nature of discharged chemicals, the small volumes expect to be released to the marine environment and the nature of the marine environment within the vicinity of the operational area, the operational planned discharges are not predicted to have ecologically significant effects.

6.6.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts to air and water quality from planned discharges and emissions from activities [EPO-RE-03]

The control measures considered for this EPO are shown in Table 6-16, with EPSs and measurement criteria for the EPO described in Table 8-2.

Table 6-16: Control measures evaluation for operational discharges

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-24	Sewage system.	Engineering	Reduces potential impacts of inappropriate discharge of sewage. Provides compliance with Marine Order 96, Marine Pollution Prevention – Sewage.	Personnel cost in ensuring vessel certificates are in place during vessel contracting and in premobilisation audits and inspections and in reporting discharge levels.	Adopted – Benefits of ensuring vessels are compliant outweigh minimal costs of personnel time, and it is a legislated requirement.
RE-CM-25	Marine assurance standard	Administrative	Vessels selected and on-boarded in accordance with the Offshore Marine Assurance Procedure (SO-91-ZH-10001) to ensure contracted vessels are operated, maintained, and manned in accordance with industry standards (for example, Marine Orders) and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP.	No additional cost.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-26	Oily mixture system	Engineering	Reduces potential impacts of planned discharge of oily water to the environment. Provides compliance with Marine Order 91, Marine Pollution Prevention – Oil.	Time and personnel costs in maintaining oil record book.	Adopted – Benefits of ensuring vessels are compliant outweigh the minimal costs of personnel time, and it is a legislated requirement.
RE-CM-27	Offshore platform deck drain system and bunding.	Engineering	Reduces the likelihood of any oily or chemical content reaching the marine environment from the offshore platform.	Personnel and operational costs associated with construction and maintenance of offshore platform bunding and	Adopted – Benefit of the inspection to determine operational integrity outweigh the

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
				maintenance of bunding procedure.	cost to undertake the inspection.
RE-CM-28	Waste (garbage) management procedure	Administrative	Reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna. Stipulates putrescible waste disposal conditions and limitations. Provides compliance with Marine Order 95 (Marine pollution prevention – garbage).	Personnel cost of pre-mobilisation audits and inspections, and in reporting discharge levels.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-29	Deck cleaning product selection.	Substitute	Improves water quality discharge (reduces toxicity) to the marine environment. Those deck cleaning products planned to be released to sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V.	Personnel costs of implementing. Potential additional cost and delays of deck cleaning product substitution.	Adopted – Benefits of ensuring vessels are compliant and that those deck cleaning products planned to be released to sea meet MARPOL criteria outweigh the cost.
RE-CM-30	General chemical management procedures	Administrative	Reduces potential for inappropriate discharge of chemicals at sea through appropriate handling.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-31	Maritime Dangerous Goods Code	Administrative	Reduces potential for inappropriate discharge of dangerous goods at sea through appropriate handling.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-32	Chemical selection procedure.	Administrative	Aids in the process of chemical management that reduces the impact of liquid discharges to sea. Only environmentally acceptable products are used.	Cost associated with implementation of procedure. Range of chemicals reduced with potentially higher costs for alternative products.	Adopted – Environmental benefit of using lower toxicity chemicals outweigh procedural implementation costs.
RE-CM-33	Scupper plugs will be available for deployment in the	Engineering	Reduces the risk of spills and leaks (discharges) to sea	Additional personnel costs of ensuring	Adopted – Benefits of ensuring

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
	event of a spill to prevent deck drainage.		on vessels through use of scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled.	procedures in place and followed.	procedures are followed outweigh costs.
Additional Control Measures					
N/A	Scupper plugs on support vessels are continuously in place to prevent deck drainage.	Isolation	Would eliminate potential impacts of contaminants being discharged to sea in rainwater.	Increased health and safety risks from wet deck not draining. Large amounts of water on a vessel's deck can also cause stability issues (free-surface effect).	Rejected – Safety considerations outweigh the benefit given small volumes of contaminants.
N/A	Mandatory closed drain system on support vessels to prevent deck drainage discharged overboard.	Isolation	Would prevent the release of deck spills to sea and therefore reduce environmental impact.	Increased cost due to treatment system required, modifications to vessels, storage space required for containment of drained liquids, increase in transfers to vessels resulting in increased potential impacts and risks. Increased transfers result in increased fuel usage, increased safety risks to personnel during transfer (e.g. crushing between skips), and increase in crane movements.	Rejected – Cost outweighs the benefit given the low impact expected from planned discharges and high potential impacts from the increased transfers required.
N/A	Discharge point for cooling water discharges restricted to above sea level to allow it to cool further before mixing at sea surface.	Engineering	Reduce potential impacts associated with discharge of higher temperature water into the marine environment.	High costs to alter all current vessels to allow for discharge of cooling water at different height, not feasible on all vessels, and reduction in temperature would be minimal compared to cost of altering the discharge height.	Rejected – Cost outweighs the benefit given the low impact expected from planned discharges.
N/A	Store liquid wastes and transport to land.	Elimination	No discharge to the marine environment.	This would result in an increase in environmental impacts through increased fuel consumption and increased atmospheric emissions, both by the vessel (or transport vessel) having to return to port a number of times to unload the wastes and by land transport to the nearest disposal facility. Increased energy consumption and atmospheric emissions would also result from the disposal (e.g. incineration, treatment) of the wastes.	Rejected – This would result in an increase in environmental impacts onshore and higher risk to the safety of personnel.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
N/A	Zero discharge of bilge water	Eliminate	Would eliminate potential impacts of contaminants being discharged to sea from oily water.	Costs associated with containment and onshore disposal; space required for additional containment on primary vessels could create hazards for working on deck by limiting available space.	Rejected – Safety considerations regarding containment outweigh the environmental benefit, given the small volumes of contaminants. Discharge of treated oily water to sea is permitted maritime practice.
N/A	Zero discharge of sewage	Eliminate	Would eliminate potential impacts of contaminants being discharged to sea from sewage.	Costs associated with containment and onshore disposal; space required for additional containment on primary vessels could create hazards for working on deck by limiting available space.	Rejected – Safety considerations regarding containment outweigh the environmental benefit, given small volumes of contaminants. Discharge of treated sewage to sea is permitted maritime practice.
N/A	Zero discharge of cooling water	Eliminate	Would eliminate potential impacts of cooling water (elevated temperature) being discharged to sea.	Costs associated with containment and onshore disposal; space required for additional containment on primary vessels could create hazards for working on deck by limiting available space.	Rejected – Safety considerations outweigh the benefit, given small volumes of contaminants.
N/A	Zero discharge of brine water	Eliminate	Would eliminate potential impacts from brine discharges by storing on-board for onshore disposal.	Cost associated with transporting waste brine water; space required for additional containment on primary vessels could create hazards for working on deck by limiting available space.	Rejected – Cost grossly disproportionate to environmental benefit. Limited benefit to be gained, given low impact. No detectable change in water quality expected. Water making and brine discharge permitted maritime practice.
N/A	Zero discharge of putrescible waste	Eliminate	Would eliminate potential impacts from putrescible waste discharges by storing	Cost associated with transporting putrescible waste to shore, space required for additional containment on primary	Rejected – Cost grossly disproportionate to environmental benefit. Limited

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			on-board for onshore disposal.	vessels could create hazards for working on deck by limiting available space. Health risks and costs associated with storage on board and transport/disposal onshore.	benefit to be gained, given low impact. Health risks associated with managing putrescible waste in hot weather conditions, putrescible waste discharge is a permitted maritime practice.

6.6.4 Environmental impact assessment

Receptor	Consequence Level
Operational Discharges	
Threatened, migratory, or local fauna	Marine fauna may transit through the area, and there is one foraging BIA for the whale shark that overlaps the operational area and BIAs for pygmy blue whale and humpback whales as well as wedge tail shearwater and roseate tern breeding BIAs. No physical environments or habitats are identified in the area over which operational discharges are expected to disperse other than open water. Impacts will be limited to short-term possible temporary behavioural effects observed in fish, sharks and seabirds. The consequence level for these receptors is considered to be I – Negligible.
Physical environment or habitat	Impacts to water quality that will be experienced in the discharge mixing zone will be localised and will occur only as long as the discharges occur (i.e. no sustained impacts); therefore, recovery will be measured in hours to days. Changes to water quality may result in an alteration to marine fauna behaviour. Sensitive receptors that may be impacted include fish at surface, marine turtles and mammals, and seabirds. Any effects on water quality are expected to be within the surface waters only and have no effect on seabed receptors. Given the infrequency of discharges (approximately every two months) and the highly dispersive waters of the operational area with strong drift current and local scale currents (average and maximum surface current speeds of 0.30 m/s and 2.51 m/s respectively, RPS 2024)), impacts will be limited to short-term water quality impacts and possible temporary behavioural effects observed in fish, sharks and seabirds. The consequence level for these receptors is considered to be I – Negligible.
Socio-economic receptors	Planned operational discharges are not expected to impact on socio-economic receptors. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. In addition, no stakeholder concerns have been raised regarding this event. The consequence level for these receptors is considered to be I – Negligible.
Threatened ecological communities	Not applicable – No threatened ecological communities are identified in the area over which planned discharges are expected.
Protected areas	Not applicable – No protected areas are identified in the area where planned discharges could affect water quality.
Overall worst-case consequence	I – Negligible

6.6.5 Demonstration of ALARP

During the activities, small amounts of sewage, putrescible waste and wash-down water will be generated on the WHP and support vessels, and these are unavoidable as routine maintenance is required on these facilities and vessel are required to undertake IMMR and CoP activities.

The alternative to discharging these small amounts of liquids to the marine environment is to store and transport the wastes to land, where they would be disposed of in line with industry best practice. However, this would result in an increase in environmental impacts through increased fuel consumption and increased atmospheric emissions, both by the vessel (or transport vessel) having to return to port a number of times to unload the wastes and by land transport to the nearest disposal facility. Increased energy consumption and atmospheric emissions would also result from the disposal (e.g. incineration, treatment, etc.) of the additional wastes. This method would also result in an increased risk of vessel -to -platform or vessel-to-vessel collision, which could lead to a marine diesel spill. Therefore, this option would be of no net environmental benefit and would increase the risk associated with the activity, so it has not been adopted.

Therefore, to reduce the impacts and risks associated with discharging liquid wastes, these wastes will be treated in line with industry best practice. Discharge of sewage and other liquid wastes from vessels in Australian waters is permissible under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, which reflects requirements of MARPOL 73/78 Annexes IV, V and I and AMSA Marine Orders 95 and 96.

Generating oily mixture from deck drainage and machinery spaces is unavoidable for the WHP and its support vessels. Discharge of sewage and other liquid wastes from vessels in Australian waters is permissible under the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, which reflects requirements of MARPOL 73/78 Annexes IV, V and I and AMSA Marine Orders 95 and 96.

Maintenance or modification of topsides and subsea equipment is required to ensure the integrity of the hydrocarbon production and transport infrastructure. Facilities designs, together with procedures, work plans and risk assessments developed for specific jobs, help to manage the volume of chemicals, hydrocarbons and other wastes released during these interventions.

The MARPOL standard and AMSA marine orders are considered to be the most appropriate standard to adhere to in this environment, given the nature and scale of the activity, and are widely accepted and used in the industry. Compliance with these requirements, together with implementation of the controls listed above, reduces the environmental impacts and risks associated with operational discharges to marine environment to ALARP.

6.6.6 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence from operational discharges is I Negligible.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10. Yes – management consistent with the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, which in Australian waters is enacted by the Marine Orders.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised by stakeholders for this event.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Release of non-hazardous discharges into the sea from vessels in Australian waters is permissible under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, which in Australian waters reflects MARPOL Annex I, IV, and V requirements respectively, and is enacted by:

- Marine Order 91 (Marine pollution prevention – oil)
- Marine Order 96 (Marine pollution prevention – sewage)

- Marine Order 95 (Marine pollution prevention – garbage).

Operational discharges from vessels will result in short-term and localised impacts; however, with consideration of the control measures in place, based on Santos' consequence matrix (Table 5-4), the worst-case impact is assessed as 'Negligible'.

The activity is consistent with the relevant actions described in the recovery plans listed in Table 3-10.

No impacts to other marine park values are expected. No stakeholder concerns have been raised regarding the activity.

The operational discharges are not expected to significantly impact the receiving environment given the nature of the open ocean environment and management controls proposed, including compliance with all relevant Marine Orders requirements. The Marine Orders are considered to be the most appropriate standard given that the nature and scale of the events is expected to reduce the potential for environmental impacts to a level that is considered ALARP and environmentally acceptable.

6.7 Planned chemical and hydrocarbon discharges

6.7.1 Description of event

Event	Planned discharges during operations, IMMR and CoP to the marine environment include: • Hydraulic fluid (valve operation on subsea equipment) • Discharges of metal ions from cathodic protection systems on DC supply pipeline • Discharges from maintenance activities (e.g. from venting or releases during removal, replacement or repair of subsea infrastructure, pig launchers and receivers, leak testing, fabric maintenance) • Paint and chemicals from cleaning, inspection and repair of infrastructure and DC supply pipeline • Non-routine opening of the subsea system. • Testing of fire-fighting foam <u>Hydraulic fluids</u> Hydraulic fluid, used in the subsea equipment as a lubricant and sealant, may be released in very small quantities when subsea valves are used or tested. The estimated quantity released by the operation of a single valve is very small (<10 mL). <u>Metal ions from cathodic protection</u> Use of sacrificial anodes for cathodic protection and corrosion prevention continually releases metal ions into the marine environment at an extremely low rate as most of the ions released will supply electrons to the steel surface of the DC supply pipeline to form a protective film. Santos uses aluminium and zinc anodes for cathodic protection. <u>Maintenance activities</u> Maintenance activities may also result in planned discharges of fluids with low concentrations of hydrocarbons or chemicals. Residual hydrocarbons, corrosion inhibitor, biocides and treated seawater are likely to enter the subsea marine environment from maintenance and operations activities. Small volumes of treated seawater will be released into the marine environment during these activities (~10 m^3). Gas or condensate may be vented or released after flushing and opening of a system, residual hydrocarbons and chemicals may also be released during these activities. Leak testing of the subsea system may occur and result in small volumes (estimated at <50 mL) of non-toxic dye released. Integrity testing of subsea infrastructure can result in a methane gas bleed off. Brine (NaCl) may also be released during this activity in small volumes. Leak testing may make use of a dye to detect leaks in a subsea system which may be released in small quantities. <u>Paint and chemicals</u> Paint may be stripped from the WHP structure to undertake a visual inspection or preventive maintenance of the infrastructure. The removal of paint or external coating from infrastructures releases inert materials into the marine environment that will either fall to the seabed floor or be dispersed with the prevailing currents. Cleaning agents (e.g. grit during blasting) are transferred to the platform and are injected into the cleaning process system. Cleaning wastes (e.g. cleaning agents and cleaning residues) will be collected and transferred off the platform. Removing corrosion, external coating or marine growth from subsea infrastructure during cleaning releases inert materials and marine growth into the marine environment, which will either fall to the seabed floor or is dispersed with the prevailing currents. Subsea cleaning may require the use of acid wash chemicals to assist in calcareous marine growth removal. Chemicals selected for use during this activity will follow Santos' Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-10001). <u>Non-routine opening of the subsea system</u> Non-routine work on subsea systems may require opening of the system (e.g. for the repair or replacement of equipment). This type of work occurs infrequently, typically every few years. Prior to work involving opening of the subsea system, hydrocarbons are flushed towards the DCGP with seawater containing chemicals (biocide) used to preserve the system. By opening the existing system or by replacing infrastructure during upgrade works, some treated seawater will be released to the marine environment with the potential for residual liquid hydrocarbons (condensate) to be associated with the discharge, although the flushing process is designed to reduce the amount of hydrocarbons left in the system to as low as practicable. Biocides are used at a concentration required for effective preservation of the subsea system (typically 200–1,000 ppm). The volume of treated seawater released will vary depending on the type of maintenance or repair being performed and the capacity of the infrastructure being worked on, but the volume is typically in the order of 2 m^3. As with replaced equipment and infrastructure, new equipment and infrastructure may also be dosed with biocide (e.g. biocide sticks) prior to hook-up to the existing facility. <u>Fire-fighting foam</u> During routine testing that could occur on vessels during the activity, aqueous film-forming foam (AFFF) could be discharged from the foam tanks over each area covered by an AFFF firefighting system. It is unavoidable that some of this foam will be discharged to sea unless it is discharged within a closed bunding system.

Extent	Localised: Chemicals, residual hydrocarbons and hydraulic fluids may be discharged to the marine environment from the surface or close to the seabed. Discharges will be relatively minor in volume and dissipate quickly in the open ocean marine environment. Temporary localised decline in water quality in the immediate vicinity of the discharge.
Duration	During the life of the activity and during IMMR and CoP activities intermittent discharges will occur and will last from minutes to several hours over the course of the activity.

6.7.2 Nature and scale of potential environmental impacts

Potential receptors: Water quality, fish (pelagic) and sharks, marine mammals, marine turtles, seabirds, and cultural receptors (totemic species).

The potential environmental impacts from planned chemical and hydrocarbon discharges include:

- temporary localised decline in water quality in the immediate vicinity of the discharge
- toxicity to marine fauna.

6.7.2.1 Physical environment

Hydraulic fluids

Hydraulic fluids are used extensively in the petroleum industry in subsea production systems. Hydraulic fluids are either petroleum or water-based blends with additives. The main properties required of a hydraulic control fluid are low viscosity, low compressibility, corrosion protection, resistance to microbiological attack and compatibility with seawater. The potential impacts of hydraulic fluid discharges near the seabed are a localised reduction in water quality and potential toxicity to benthic marine fauna associated with unconsolidated sediments or attracted / attached to seabed equipment (e.g. fish, infauna and sessile filter feeding organisms). Due to the small volumes (around 25 L per release) it is likely that any impacts to benthic fauna and water quality will be highly localised, if occurring at all.

Hydraulic fluids behave similarly to MDO when discharged in the marine environment (information about MDO and potential impacts to the environment is provided in Section 7.8). Hydraulic fluids are medium oils of light to moderate viscosity and have a relatively rapid spreading rate and, like MDO, will dissipate quickly, particularly in high sea states.

Acid wash

Inorganic or organic acids used for marine growth removal are expected to rapidly disperse in the offshore marine environment. Due to the small volumes discharged during marine growth removal, impacts to benthic fauna and water quality will be highly localised.

Residual hydrocarbons

Maximum residual hydrocarbon volumes that could be released during IMMR activities are estimated to be at a concentration of 30 ppm as part of the treated water discharge following flushing of the pipeline.

The small volumes and low concentrations of residual hydrocarbon released are expected to rapidly disperse and are unlikely to impact benthic fauna and water quality in the vicinity of the release is expected to quickly return to background.

Paint and chemicals

Removing paint or external coating from infrastructure releases inert materials into the marine environment, which will either fall to the seabed or disperse with the prevailing currents. These activities are carried out infrequently and will not significantly affect the marine environment. It is unlikely that the dispersed fines will be found in sufficient concentrations to cause toxic effects to marine fauna (e.g. from ingestion) due to the rapid dispersion and open ocean environment.

Treated seawater, MEG, methanol, scale inhibitor and glycol

Treated seawater will contain a biocide, Although biocides typically contain a substance (quaternary ammonium chloride) which is known to be very toxic to aquatic organisms, the concentration is typically very low (less than 30%) within the biocide itself as a whole.

MEG and methanol both have low toxicity, are readily biodegradable, are rated as PLONOR and E (non-CHARM) in the OCNS rankings.

Scale inhibitor is not expected to biodegrade when released to the marine environment. however, scale inhibitor is not known to bioaccumulate. Scale inhibitor and glycol both have low aquatic toxicity and the small volumes released will dilute rapidly when released to the marine environment.

Therefore, it is likely that any impacts to benthic fauna and water quality will be highly localised, if occurring at all.

The discharges of residual hydrocarbons or chemicals in treated water are generally low and are most likely due to entrapment in pockets of subsea system gas or condensate that may be vented or released after flushing and opening of that system and chemicals in treated seawater (e.g. biocide) that are discharged during temporary opening up of subsea equipment. Similarly, leak testing would make use of a dye to detect leaks in a subsea system.

Toxicity

On discharge to the marine environment, the low volumes of chemicals and residual hydrocarbons are expected to rapidly disperse in the offshore marine environment. Hence, any potential impacts would be confined to a localised area immediately surrounding the discharge.

There may be a localised and temporary (hours) reduction in water quality in the immediate vicinity of the release. Toxicity impacts to marine fauna from the release of chemicals are unlikely to eventuate because:

- strong ocean currents result in the discharge being further diluted upon release to the marine environment, so the duration of exposure of chemicals to fauna will be minimal
- the chemicals will have been risk assessed for their suitability for discharge using Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-10001)
- the sensitivity of the receiving environment is considered low
- potential discharges will be intermittent and temporary within the operational area.

6.7.2.2 Impacts to threatened or migratory fauna

As discussed in the sections above, the discharge extent for all planned chemical and residual hydrocarbon discharges is localised, and rapid dilution is predicted to occur within the offshore waters. Marine fauna within the operational area are likely to be transient. The operational area overlaps with the whale shark foraging BIA, pygmy blue whale distribution and humpback whale migration BIA, roseate tern and wedge-tailed shearwater breeding BIAs, therefore these species are more likely to be encountered in the operational area. However, if contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and the transient fauna movement, such that any exposure is likely not of sufficient duration to cause a toxic effect. Impacts to critical habitat identified for turtles that overlaps the operational area will not be significantly modified or affected by these chemical and residual hydrocarbon discharges due to the rapid dilution and dissipation in the open ocean waters.

Discharges may cause changes to behaviour in marine fauna (avoidance or attraction). However, such discharges would be isolated occurrences and not in any one location, so no prolonged influence on faunal behaviour is expected. Given the nature of the discharges (localised, rapid dilution, intermittent), any behavioural impacts are expected to be short term and minimal.

Given the nature of discharged chemicals and residual hydrocarbons, the small volumes expect to be released to the marine environment and the nature of the marine environment within the vicinity of the operational area, the planned chemical and hydrocarbon discharges are not predicted to have ecologically significant effects.

6.7.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts to air and water quality from planned discharges and emissions from activities [EPO-RE-03]

The control measures considered for this EPO are shown in Table 6-16, with EPSs and measurement criteria for the EPO described in Table 8-2.

Table 6-17: Control measures evaluation for Chemical and residual hydrocarbon discharges

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-27	Offshore platform deck drain system and bunding.	Engineering	Reduces the likelihood of any oily or chemical content reaching the marine environment from	Personnel and operational costs associated with construction and maintenance of offshore platform	Adopted – Benefit of the inspection to determine operational integrity

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			the offshore platform.	bunding and maintenance of bunding procedure.	outweigh the cost to undertake the inspection.
RE-CM-30	General chemical management procedures.	Administrative	Reduces potential for inappropriate discharge of water at sea, through appropriate handling, to maintain planned discharges to sea meet the criteria for not being harmful to the marine environment.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-32	Chemical selection procedure.	Administrative	Aids in the process of chemical management that reduces the impact of liquid discharges to sea. Only environmentally acceptable products are used.	Cost associated with implementation of procedure. Range of chemicals reduced with potentially higher costs for alternative products.	Adopted – Environmental benefit of using lower toxicity chemicals outweigh procedural implementation costs.
RE-CM-33	Scupper plugs will be available for deployment in the event of a spill to prevent deck drainage.	Engineering	Reduces the risk of spills and leaks (discharges) to sea on vessels through use of scupper plugs or equivalent deck drainage control measures available where chemicals and hydrocarbons are stored and frequently handled.	Additional personnel costs of ensuring procedures in place and followed.	Adopted – Benefits of ensuring procedures are followed outweigh costs.
RE-CM-34	Pipeline flushing prior to opening of the subsea system.	Engineering	Production fluids (hydrocarbons) will be flushed through with treated water to the DCGP prior to maintenance activities. Reduces the toxicity of chemicals and residual hydrocarbons in subsea infrastructure before any	Additional costs and time taken to flush DC supply pipeline.	Adopted – Environmental benefits of flushing outweigh the associated costs.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			release to sea during activities.		
RE-CM-35	Vessel spill response plans (SOPEP/ SMPEP)	Administrative	Implements response plans on board vessels to deal with unplanned hydrocarbon releases and spills quickly and efficiently in order to reduce impacts to the marine environment.	Administrative costs of preparing documents. Generally undertaken by vessel contractor so time for Santos personal to confirm and check SOPEP/ SMPEP in place.	Adopted – Benefits of implementing response plans considered to outweigh costs.
Additional Control Measures					
N/A	Store liquid wastes and transport to land.	Eliminate	No discharge to the marine environment.	This would result in an increase in environmental impacts through increased fuel consumption and increased atmospheric emissions, both by the vessel (or transport vessel) having to return to port a number of times to unload the wastes and by land transport to the nearest disposal facility. Increased energy consumption and atmospheric emissions would also result from the disposal (e.g. incineration, treatment) of the wastes.	Rejected – This would result in an increase in environmental impacts onshore and higher risk to the safety of personnel.
N/A	Reduce, capture or eliminate use of chemicals and hydraulic fluid	Eliminate	Would eliminate or reduce the chemical and hydraulic fluid discharge to the marine environment.	Chemicals are assessed to ensure the discharge is environmentally acceptable in accordance with Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-10001). Excessive use of chemicals is restricted. Eliminating the use of chemicals and hydraulic fluid would cause safety and process issues.	Rejected – Safety and process considerations outweigh the environmental benefit, given small volumes and low toxicity of the discharges.

6.7.4 Environmental impact assessment

Receptor	Consequence Level
Chemical and residual hydrocarbon discharges	
Threatened, migratory, or local fauna	Marine fauna may transit through the area, and there is one foraging BIA for the whaleshark that overlaps the operational area and BIAs for pygmy blue whale and humpback whales as well as wedge tail shearwater and roseate tern breeding BIAs. No physical environments or habitats are identified in the area over which chemical and residual hydrocarbon discharges are expected to disperse other than open water. Impacts will be limited to short-term possible temporary behavioural effects observed in fish, sharks and seabirds. Only short-term behavioural impacts are expected with no decrease in local population size, area of occupancy of species, loss or disruption of habitat critical. disruption to the breeding cycle and introduction of disease. Any effects on water quality are expected to be highly localised and have little to no effect on seabed receptors. The consequence level for these receptors is considered to be I – Negligible.
Physical environment or habitat	Impacts to water quality that will be experienced in the discharge mixing zone will be localised and will occur only as long as the discharges occur (i.e. no sustained impacts); therefore, recovery will be measured in hours to days. Changes to water quality may result in an alteration to marine fauna behaviour. Sensitive receptors that may be impacted include fish at surface, marine turtles and mammals, and seabirds. Any effects on water quality are expected to be within the surface waters only and have no effect on seabed receptors. Given the infrequency of discharges and the highly dispersive waters of the operational area with strong drift current and local scale currents (average and maximum surface current speeds of 0.30 m/s and 2.51 m/s respectively, RPS 2024)), impacts will be limited to short-term water quality impacts and possible temporary behavioural effects observed in fish, sharks and seabirds. The consequence level for these receptors is considered to be I – Negligible.
Socio-economic receptors	Planned chemical and residual hydrocarbon discharges are not expected to impact fishery resources (demersal fish species) and are unlikely to result in changes in distribution and abundance of fish species outside the operational area. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. WAFIC stated that it had concerns about the impact of operational discharges associated with IMMR activities on commercial species and the broader marine environment, with specific reference to treated seawater containing scavenger and biocide discharged in the marine environment. Santos responded to WAFICs concerns by providing information on how a higher volume release of treated seawater the DC supply pipeline will be managed (Section 6.8.5 and Table 4-9). WAFIC responded to Santos outlining that it had no further concerns Table 4-9. The consequence level for these receptors is considered to be I – Negligible.
Threatened ecological communities	Not applicable – No threatened ecological communities are identified in the area over which planned discharges are expected.
Protected areas	Not applicable – No protected areas are identified in the area where planned discharges could affect water quality.
Overall worst-case consequence	I – Negligible

6.7.5 Demonstration of ALARP

The use of chemicals to conduct testing on seabed equipment is a standard technique that is considered critical in determining the presence of leaks and equipment integrity. Alternatives to the use of chemicals include freshwater. The use of freshwater in the subsea system can result in hydrate formation and introduce integrity risks; therefore, it is not considered feasible. The use of treated seawater is also an industry standard and uses chemicals that have been appropriately risk assessed under the Operations Chemical Selection Evaluation and Approval Procedure (EA 91 II 10001).

Marine growth removal is required on seabed assets so they can be safely removed from the operational area as required by legislation and regulations. Acid wash would only be used for marine growth removal if removal by mechanical means could not be achieved.

Similarly, the release of small volumes of residual hydrocarbons during IMMR cannot be avoided.

The use of AFFF is required for emergency response purposes and routine testing the foam fire-fighting system is critical for maintaining emergency response capabilities on vessels. The product has been assessed through the Santos Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001), ensuring potential impacts are acceptable.

The continued monitoring and replacement of cathodic protection on the pipeline will reduce the need for future intervention activities by providing added protection of the pipeline.

The alternative to discharging these small amounts of chemicals and residual hydrocarbons to the marine environment is to store and transport the wastes to land, where they would be disposed of in line with industry best practice. However, this would result in an increase in environmental impacts through increased fuel consumption and increased atmospheric emissions, both by the vessel (or transport vessel) having to return to port a number of times to unload the wastes and by land transport to the nearest disposal facility. Increased energy consumption and atmospheric emissions would also result from the disposal (e.g. incineration, treatment, etc.) of the additional wastes. This method would also result in an increased risk of vessel to platform or vessel-to-vessel collision, which could lead to a marine diesel spill. Therefore, this option would be of no net environmental benefit and would increase the risk associated with the activity, so it has not been adopted. Some discharges (particularly those subsea) are also not feasible to contain completely.

With implementation of the controls listed above, the environmental impacts and risks associated with chemical and residual hydrocarbon discharges to marine environment is reduced to ALARP.

6.7.6 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence from chemical and residual hydrocarbon discharges is I- Negligible.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10 Yes – management consistent with the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, which in Australian waters is enacted by the Marine Orders.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – WAFIC stated that it had concerns about the impact of operational discharges associated with IMMR activities on commercial species and the broader marine environment, with specific reference to treated seawater containing scavenger and biocide discharged in the marine environment. Santos responded to WAFICs concerns by providing information on how a higher volume release of treated seawater the DC supply pipeline will be managed (Section 6.8.5 and Table 4-9). WAFIC responded to Santos outlining that it had no further concerns Table 4-9.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The use of hydraulic fluids, acid wash, treated seawater and other chemicals is unavoidable as they are required to safely complete the activities and preserve seabed equipment. The release of residual hydrocarbons during IMMR is also unavoidable during the activity. However, water quality and benthic impacts will be highly localized to the immediate vicinity of the discharge. The operational area is not located nearby to any sensitive habitat.

The application of the chemical selection procedure is an important control for reducing the toxicity of any chemicals that may be discharged during the activities. In accordance with the procedure, CHARM-rated Gold/Silver and non-CHARM grouped E/D chemicals managed under the OCNS, or PLONOR substances listed by OSPAR, or chemicals risk assessed by Santos and deemed environmentally acceptable, will be selected.

With control measures in place to minimise the environmental impact of chemical and hydrocarbon discharges, the consequence was assessed as I-Negligible and ALARP. The managed discharges will not reduce the habitat values of the area potentially affected as described in relevant Recovery Plans or Approved Conservation Advice or be inconsistent with the strategies of these documents. Concerns raised by WAFIC during the consultation process regarding the impacts of operational discharges associated with IMMR activities were responded to and no further concerns were raised (Table 4-9). Therefore, the negligible impacts expected from the proposed discharges are considered to be environmentally acceptable.

6.8 Treated Seawater Discharge

6.8.1 Description of event

Event	Once the Reindeer facilities reach the end of field life they will need to be flushed of hydrocarbons and preserved for future decommissioning or other uses. Following flushing of the pipeline to DCGP, the pipeline will be filled with treated seawater. Following flushing the pipeline may be re-preserved with treated seawater or an inert gas such as nitrogen. There are then two potential scenarios for the discharge of treated seawater from within the DC supply pipeline to the marine environment. The decision for these options will be determined at a later stage based on whether the pipeline will be decommissioned or re-used. 1. If preservation with nitrogen is required the flushing spread is likely to be positioned at DCGP due to the size of the equipment spread, rather than on the WHP or a large DP vessel adjacent to the WHP. The proposed activity is therefore that the pipeline is preserved with nitrogen from DCGP to the WHP and the treated seawater is discharged to sea. 2. The pipeline may require re-preservation with treated seawater as the treated seawater loses its effectiveness over 3 years. If re-preservation with treated seawater is required, the pipeline contents will be flushed to sea and a new batch of treated seawater added. It is assumed that the DCGP will already be in decommissioning phase (as a worst-case scenario), and therefore the DCGP may be unable to handle the large volume of treated seawater or equipment may be out of service, therefore a discharge to sea is assumed. Only one of the above scenarios will be required during the life of this EP. For the purposes of the risk assessment a release of 13,000 m³ of treated seawater (containing chemicals and residual hydrocarbons) from the WHP over 56 hours, with a discharge rate of 232 m³/hr has been modelled. The discharge will be conducted through a horizontally oriented pipe situated 23 m above the sea surface. Initial concentrations of the chemical treatment and hydrocarbons in the discharged seawater are assumed to be 1,000 ppm and 30 ppm, respectively. Santos plans to use a combined biocide and oxygen scavenger chemical treatment package, likely Hydrosure 0-3670R, for treating seawater and preserving flowlines. The treated seawater will comprise seawater, oxygen scavenger (to control corrosion) and biocide (to prevent biofouling on the internal surfaces of the pipeline) that have been assessed through the Santos chemical selection procedure to ensure that environmentally acceptable products are used or the risks can be demonstrated to be ALARP from the use of other chemicals.
Extent	The results from modelling indicate that at a concentration level of PC99% (at, or above, 0.06 ppm), the maximum distances from the release location were 4.96 km for the 50th percentile and 12.88 km for the 95th percentile.
Duration	The duration of the release is estimated at 56 hours at a rate of 232 m³/hr.

6.8.2 Nature and scale of environmental impacts

Potential receptors: physical environment (water quality, benthic habitat); threatened, migratory or local fauna; socioeconomic receptors; and cultural features.

The potential environmental impacts from planned treated seawater discharges include:

- temporary localised decline in water quality in the immediate vicinity of the discharge
- toxicity to marine fauna.

6.8.2.1 Modelling Parameters and results

Modelling parameters and setup

RPS (2024b) simulated near-field mixing and dispersion of the treated water discharge using the three-dimensional flow model, CORMIX. A summary of the treated seawater discharge characteristics are presented in Table 6-18. The discharge was assumed to occur 23 m above the seabed surface through a single outlet from a diffuser orientated horizontally off the WHP with a 4-inch diameter. The discharge was anticipated to have a salinity and temperature as per ambient waters.

Table 6-18: Summary of the treated seawater discharge characteristics

Parameter	Inputs
Total volume of treated seawater released (m^3)	13,000
Flow rate (m^3/hr)	232

Parameter	Inputs
Internal diameter of outlet pipe (inches)	4
Number of ports	1
Outlet pipe orientation	Horizontal
Discharge location	Reindeer WHP/vessel at the WHP
Discharge height above the sea surface (m)	23
Water depth at discharge (m)	58
Discharge temperature (same as ambient seawater)	26.7
Discharge salinity (same as ambient seawater)	35.1

Inputs to the CORMIX model also included constant current speeds. The 10-year data was statistically analysed to determine the 5th, 50th and 95th percentile current speeds at varying depths (Table 6-19) for input to the near-field model to reflect contrasting mixing and advection cases:

- 5th percentile current speed: weak currents, low mixing and slow advection
- 50th percentile (median) current speed: average currents, moderate mixing and advection
- 95th percentile current speed: strong currents, high mixing and rapid advection to nearby areas.

The 5th, 50th and 95th percentile values are referenced as weak, medium and strong current speeds, respectively.

Table 6-19: Adopted ambient current conditions adjacent to the WHP release location

Depth (m)	5th percentile (weak) current speed (m/s)	50th percentile (medium) current speed (m/s)	95th percentile (strong) current speed (m/s)
0–10	0.07	0.28	0.57

Far-field modelling was also completed to allow the time-varying nature of currents to be included and for the potential for localised build-up when current speeds are low (e.g. at the turning of the tide) and recirculation of the plume back to the discharge location might occur. The mixing and dispersion of the chemical treatment and hydrocarbons was predicted using the three-dimensional discharge and plume behaviour model, MUDMAP. 25 simulations were run for each season (3) and each simulation had a different start time, which ensured a range of current conditions were sampled. In total 75 simulations were modelled as part of the assessment, which were reported on an annual basis (RPS, 2024b). Each simulation was run for 72 hours.

Note the concentrations presented assume the background concentration of the chemical treatment and hydrocarbons in the receiving waters is zero and there is no biodegradation of the chemical treatment during the simulation.

Whole of Effluent Toxicity T Testing

To evaluate the environmental impact of discharging treated effluent into the marine environment, Santos utilised the Whole of Effluent Toxicity (WET) testing study conducted for Hydrosure by Chevron (Chevron, 2015). As this is likely the type of combined water treatment chemical that will be used for preservation of the DC supply pipeline. This testing study aimed to determine the potential toxicity of the effluent on a variety of local marine species under different exposure concentrations.

Testing was undertaken according to protocols recommended by the Australian and New Zealand Guidelines for fresh and marine water quality (ANZG) (2000) and included 5 locally relevant species from a range of trophic levels (primary producer, herbivore and carnivore). Note that the ANZG are now able to be accessed online and a ‘conceptual model’ process has been introduced so that community and local government thresholds are also included when selecting ‘default guideline values’; this new process is unlikely to change the guideline values for Commonwealth Waters offshore marine water quality (ANZECC and ARMCANZ, 2018). Results show that NOECs ranged from 0.13 ppm for the crustacean to 12.5 ppm for the fish. In general, simpler life forms (algae and species in their larval stage) exhibited higher sensitivity compared to more complex life forms such as fish (Chevron 2015).

Key findings from the Chevron (2015) study indicated the No Observable Effects Concentration (NOEC) for the treated effluent. For a 99% species protection level (PC99), the NOEC was determined to be 0.06 mg/L. For a 95% species protection level (PC95), the NOEC was slightly higher at 0.1 mg/L (RPS, 2024b).

For long-term continuous discharges (e.g. sewage outfalls), ANZG (2018) recommend that the 99% species protection concentrations (PC99%) should be applied to develop environmental criterion for high-conservation ecosystems. For chemicals with negligible potential for bioaccumulation, the 95% level of species protection (PC95%) may also be applied.

The NOEC thresholds are derived from long–term ecological tests whereby organisms are exposed for periods typically between 48 and 96 hours. In this instance, the dose that environmental receptors shall receive will be less than those exposed in the toxicological tests due to the short release duration (35 hours) and altering tidal directions. This resulted in concentrations not exceeding the conservative NOEC PC99% threshold of 0.06 ppm for a period where effects would be expected to be observed (>48 hours).

Table 6-20: Ecotoxicological testing results for Hydrosure

Species	Test	Type	EC10 ppm	EC50 ppm	LOEC ppm	NOEC ppm
Nitzschia closterium (algae)	72-hour growth inhibition	Chronic	1.5 *	3.3 (3.0–3.58)	2.50	1.30
Saccostrea echinata (mollusc)	48-hour larval abnormality	Chronic	0.29 (0.24–0.33)	0.54 (0.52–0.56)	0.50	0.250
Heliocidaris tuberculata (echinoderm)	72-hour larval development	Chronic	1.30 (1.27–1.32)	1.71 (1.70–1.74)	2.50	1.25
Melita plumulosa (crustacean)#	96-hour acute toxicity	Acute	0.08 (0.04–0.11)	0.14 (0.10–0.16)	0.25	0.13
Lates calcarifer (fish)#	96-hour acute toxicity	Acute	13.5 (12.3–18.0)	17.5 (17.1–18.0)	25.0	12.5

Source: Chevron (2015)

**95% confidence limits are not reliable; numbers in brackets represent the 95% fiducial limits.*

 # Toxicity test is defined as an acute test

Based on an initial concentration of 1,000 ppm for the chemical treatment in the treated seawater, the necessary dilution to achieve the target concentration of 0.06 ppm for the PC99% is 1:16,667. The NOEC values for varying species protection levels and the dilutions to achieve the concentration based on an initial dosage of 1,000 mg/L are presented in Table 6-21. A 1:16,667 dilution is required to achieve a PC99%.

Table 6-21: Species protection concentrations for Hydrosure 0-3670R (from Chevron, 2015)

Species protection level	NOEC threshold (mg/L)	Dilutions required to achieve the NOEC threshold based on an initial dosing concentration of 1,000 ppm (mg/L)
PC99%	0.06	1:16,667
PC95%	0.10	1:10,000
PC90%	0.15	1:6,6667
PC80%	0.23	1:4,348

Residual hydrocarbons

It is anticipated that residual hydrocarbons will be present in the discharged effluent. To estimate the potential environmental impact and exposure levels of these hydrocarbons, a concentration threshold of 0.427 ppm was used, which corresponds to the 99th percentile species protection level for the Water Accommodated Fraction (WAF) of Reindeer condensate. Based on an initial concentration of 30 ppm of hydrocarbons in the treated seawater, the necessary dilution to achieve the target threshold concentration of 0.427 ppm is 1:70.

Near-Field Modelling Results

Upon exiting the horizontally orientated discharge pipe, the treated seawater sprays outward. As it reaches the sea surface, it predominantly stays within the 4-metre surface layer due to minimal density differences with the receiving environment. The shallow depth of the plume limits vertical mixing, relying solely on ambient currents for dispersion. Table 6-22 is a summary of the diameter and minimum dilutions of the treated seawater plume in the near field at 10 m and 30 m from the WHP under varying current speeds during annual based conditions. The table also includes the predicted concentrations of the chemical treatment and hydrocarbons at these distances and under different current speeds.

It's important to note, that the reported near-field predictions (Table 6-22) assume persistent and constant current speeds and directions. Model predictions do not account for the dynamic changes in hydrodynamic conditions, such as the recirculation of the plume back towards the WHP, which could significantly alter the dispersion and dilution patterns over time.

Table 6-22: Diameter and minimum dilutions of the treated seawater plume in the near-field at 10 m and 30 m from the WHP under varying current speeds during annual based conditions

Surface current speed (m/s)	Distance from the release location (m)	Plume diameter (m)	Minimum centreline dilution (1:x) of the plume	Chemical treatment concentration (ppm)	Hydrocarbon concentration (ppm)
Weak (0.05)	10	2.1	4.5	223.0	6.7
	30	2.7	8.3	121.0	3.6
Medium (0.28)	10	1.2	6.5	153.8	4.6
	30	1.6	12.7	78.4	2.4
Strong (0.57)	10	0.9	8.0	125.0	3.8
	30	1.3	15.9	63.0	1.9

Far field modelling results

All 75 simulations were consolidated and analysed to generate annual-based results. Figure 6-1 and Figure 6-2 illustrate the predicted extents for the 50th and 95th percentile chemical treatment concentrations. As outlined in Figure 6-1 the 50th percentile chemical concentration extends up to 5 km from the discharge point in a north westerly direction. In Figure 6-2 the 95th percentile chemical concentration extends up to 12 km from the discharge point. However it reaches a low concentration of 0.15–0.23 ppm within 7.5 km of the discharge point. The modelling results indicate water quality will return to below NOEC levels within 24 hours of completion of discharge. These figures reveal that the plume predominantly aligns along the northwest-southeast axis, consistent with the prevailing current directions at the site and extending slightly further northwest.

The target hydrocarbon concentration of 0.427 ppm was reached within 30 m for the 50th percentile and 75 m for the 95th percentile from the WHP. Due to the restricted extent of exposure, no images have been generated.

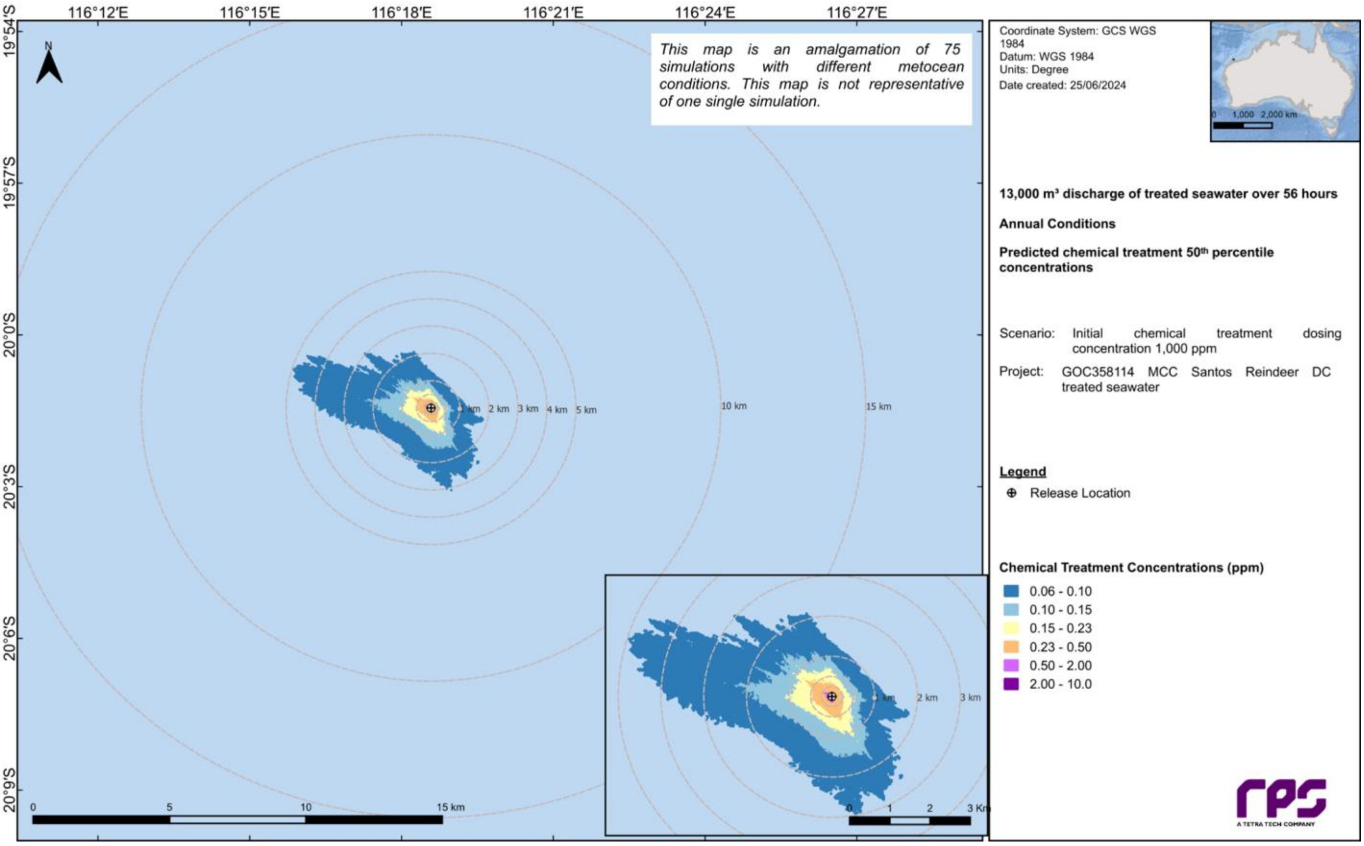


Figure 6-1: Predicted extent of the 50th percentile chemical treatment concentrations (annualised)

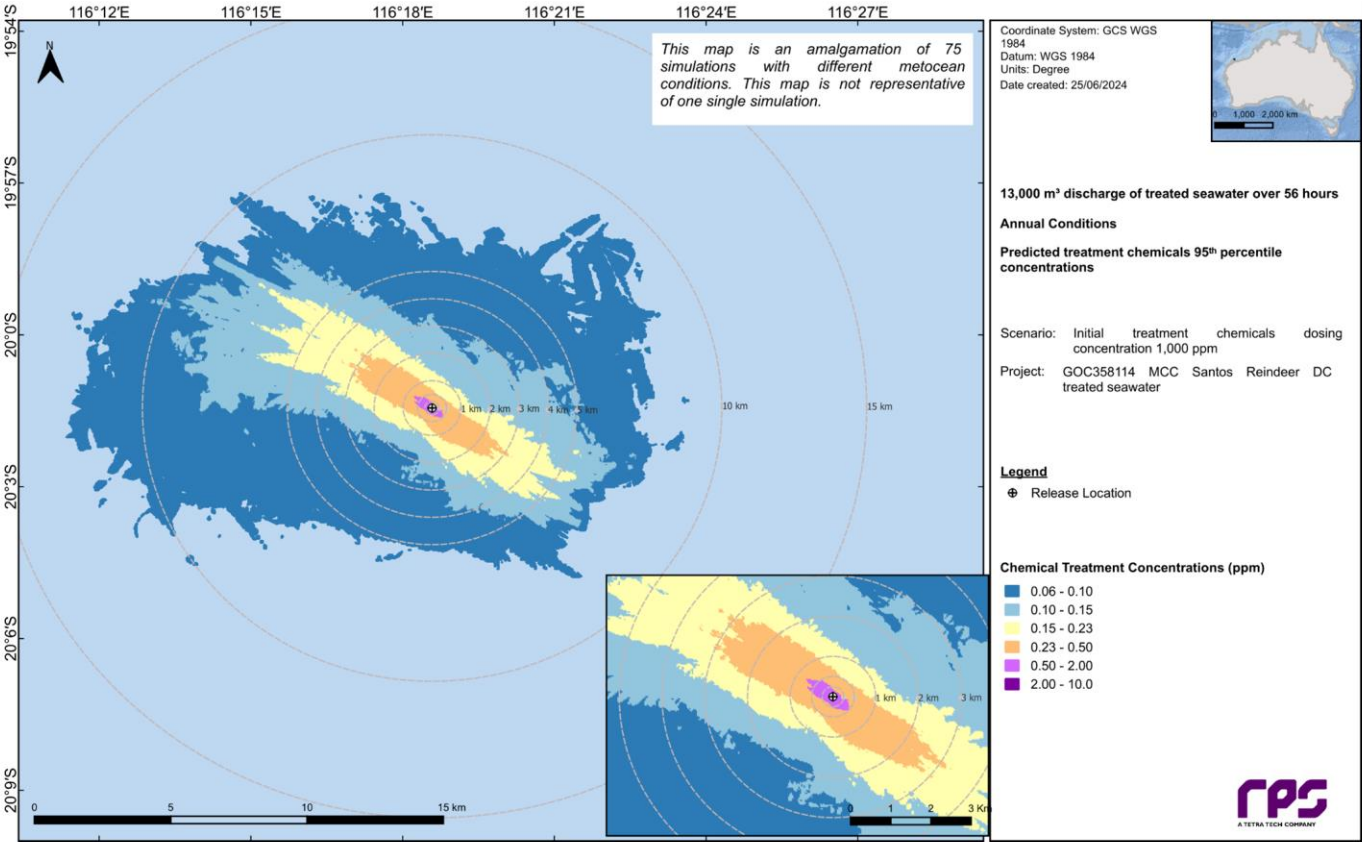


Figure 6-2: Predicted extent of the 95th percentile chemical treatment concentrations (annualised)

Table 6-23 provides a summary of the maximum distances from the WHP to achieve the NOEC values for varying species protection levels for the 50th and 95th percentile concentrations.

Table 6-23: Maximum distances from the release location to achieve the NOEC values for varying species protection levels for the 50th and 95th percentile chemical treatment concentrations

Initial chemical treatment concentration (ppm)	Species protection level	NOEC value (mg/L)	Maximum distance (km) from the WHP to the exposure value based on the 50th percentile statistics	Maximum distance (km) from the WHP to the exposure value based on the 95th percentile statistics
1,000	PC99%	0.06	4.96	12.88
	PC95%	0.10	2.52	10.60
	PC90%	0.15	1.27	7.50
	PC80%	0.23	0.82	3.55

6.8.2.2 Impacts to physical environment

Water quality

RPS (2024b) modelling predicted a maximum distance from the release location to the PC99% NOEC threshold of 0.06 ppm and PC95% NOEC threshold of 0.10 ppm of 4.96 km and 2.52 km, respectively. The maximum distance based on the PC80% NOEC threshold of 0.23 ppm did not exceed 0.8 km.

It is important to note that the modelled results presented are considered conservative, as the Hydrosure discharge concentration was set at the maximum dosage rate of 1000 ppm, whereas the likely dosage rate may be less than this. In practice, the concentration of Hydrosure in the discharge will naturally degrade over time during the discharge and reduce in concentration within the pipeline. As a result, it is anticipated that the expected initial discharge concentrations of Hydrosure will be less than those modelled. Furthermore, mixing and dilution of the effluent in the receiving waters will occur, which is likely to result in mixing zone boundaries being reached closer to the discharge point compared to that predicted by the modelling outputs.

The release of treated sea water will result in a localised (around the discharge location) and temporary minor reduction in water quality. The modelling results indicate water quality will return to below NOEC levels within

24 hours of completion of discharge. Chemicals that will be used are inherently biodegradable with low potential for bioaccumulation. For the above reasons, no substantial change in water quality is expected from activity discharges and therefore the impact is assessed as negligible.

Plankton

Plankton drifting past the outlet at the time of discharge may be exposed to concentrations above those that could elicit an effect. However, dilution of the plume is rapid and the exposure concentration travelling with the organism will continually reduce. Plankton are widely distributed in the ocean and regenerate rapidly and, in the context of their lifecycle, impacts will be short term and negligible.

Sediment quality

Due to the discharge at height from the WHP, the far-field modelling results showed that the plume was predominantly located within the 5 m surface layer. Therefore, no impact to sediment quality is expected.

6.8.2.3 Impacts to threatened or migratory fauna

As discussed in the sections above, the discharge extent for the treated seawater discharge is localised, and rapid dilution is predicted to occur within the offshore waters. discharged treated sea water may result in toxicity to marine life, with the effects greater on simpler life forms. This is illustrated in the ecotoxicological data in which the NOEC for a fish species is 12.5 ppm (time-weighted average) compared to 1.3 ppm for algae (Table 6-20). Modelling demonstrated that the concentration of the chemical will decrease to NOEC values within 5 km of the discharge location, based on the 99% species protection level under average conditions.

Marine fauna within the operational area are likely to be transient. If present, marine fauna could pass through the plume of treated seawater and would be exposed for a short duration. The operational area overlaps with the whale shark foraging BIA, pygmy blue whale distribution and humpback whale migration BIA, roseate tern and wedge-tailed shearwater breeding BIAs, therefore these species are more likely to be encountered in the operational area. However, if contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and the transient fauna movement, such that any exposure is likely not of sufficient duration to cause a toxic effect within the radius of the potential affected area. Impacts to critical habitat identified for turtles that overlaps the operational area will not be significantly modified or affected by these chemical and residual hydrocarbon discharges due to the rapid dilution and dissipation in the open ocean waters.

Discharges may cause changes to behaviour in marine fauna (avoidance). However, this would be a one-off discharge, so no prolonged influence on faunal behaviour is expected. Given the nature of the discharge (localised, rapid dilution, one-off), any behavioural impacts are expected to be short term and minimal.

Toxicity impacts to receptors from the release of treated seawater are unlikely to eventuate because:

- strong ocean currents result in the discharge being further diluted upon release to the marine environment, so the duration of exposure of chemicals to fauna will be minimal
- the chemicals will have been risk assessed for their suitability for discharge using Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-10001)
- the sensitivity of the receiving environment is considered low
- potential discharges will short term and temporary within the operational area.

6.8.3 Cumulative impacts

There is a potential for support vessels to be in the operational area when the treated seawater is being discharged from the wellhead platform. Discharges from vessels are expected to be small in volume and intermittent in nature (Section 6.6.2). It is unlikely that IMMR activities will be undertaken on the WHP or DC supply pipeline whilst treated seawater is being discharged. Discharges from IMMR activities are also expected to be of low volume and intermittent in nature. Give the localised intermittent nature of IMMR and vessel discharges, impacts are expected to be negligible.

The impacts from the discharge of treated seawater are localised and the modelling results predict water quality will return to background levels within 24 hours.

On this basis cumulative impacts as a result of planned vessel, IMMR and treated seawater discharges are not expected.

6.8.4 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- Reduce impacts to air and water quality from planned discharges and emissions from activities [EPO-RE-03].

The control measures considered for this activity are shown in Table 6-24, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 6-24: Control measures evaluation for treated seawater discharge

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-31	General chemical management procedures.	Administrative	Reduces potential for inappropriate discharge of water at sea, through appropriate handling, to maintain planned discharges to sea meet the criteria for not being harmful to the marine environment.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-32	Chemical selection procedure.	Administrative	Aids in the process of chemical management that reduces the impact of flushing fluids to sea. Only environmentally acceptable products are used. Reduces the potential impacts to culturally significant marine species, including totemic species, such as marine turtles and marine mammals.	Cost associated with implementation of procedure. Range of chemicals reduced with potentially higher costs for alternative products.	Adopted – Environmental benefit of using lower toxicity chemicals outweigh procedural implementation costs.
RE-CM-34	Pipeline flushing prior to opening of the subsea system.	Engineering	Production fluids (hydrocarbons) will be flushed through with treated water to the DCGP prior to opening the system. Reduces the toxicity of chemicals and residual hydrocarbons in subsea infrastructure before any release to sea during activities.	Additional costs and time taken to flush DC supply pipeline.	Adopted – Environmental benefits of flushing outweigh the associated costs.
RE-CM-36	Calibrated dosing system in place to ensure accuracy of chemical dosing	Engineering	Santos temporary equipment assessment procedure (SO-91-IG-10050) ensures calibration and independent verification of temporary equipment used for chemical dosing of the treated seawater therefore managing potential impact to marine	Implementation of a procedure; cost of independent verification	Adopted – Benefits of ensuring correct chemical dosing maintains pipeline integrity and reduces the potential environmental impact

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			environment to acceptable levels		
RE-CM-37	Testing of pipeline preservation fluids	Engineering	Ensures pipeline integrity is maintained through testing for bacterial colonies in the pipeline contents which is an indicator for less of effectiveness of preservation. Maintaining pipeline integrity prevents loss to the marine environment	Cost of testing and implementing procedures	Adopted – Benefits of ensuring pipeline is effectively preserved maintains pipeline integrity and reduces the potential environmental impact
Additional Control Measures					
N/a	Use of raw seawater with no chemical treatment	Eliminate	Reduction in potential impact from chemicals released to sea but increases the likelihood of loss of integrity during preservation and has potentially greater environmental impacts.	Corrosion by oxidation and microbial action will occur without the use of seawater treatment resulting in wall thickness loss. This potential loss of subsea infrastructure integrity could possibly lead to an environmental incident.	Rejected – not considered acceptable to prevent internal corrosion and ensure pipeline integrity.
N/a	Use of deoxygenated fresh water	Substitute	Reduction in potential impact from chemicals released to sea	Release of freshwater into the marine environment	Rejected – not considered practical due to the large volume of freshwater that would need to be supplied offshore
N/a	Seawater treated with oxygen scavenger and exposed to Ultraviolet (UV) light	Substitute	Reduction in potential impact from chemicals released to sea	The effectiveness of UV sterilization to kill bacteria species is affected by particulate shadowing, therefore it cannot provide an absolute sterilisation solution. Furthermore, UV sterilisation provides no 'residual' treatment and as a result corrosion causing bacteria colonies can grow during the preservation period	Rejected – not considered acceptable to prevent internal corrosion and ensure pipeline integrity.
N/a	If preserving with nitrogen, flush pipeline from WHP end to DCGP for disposal of treated seawater in evaporation ponds	Eliminate	Reduction in potential impact from chemicals released to sea	The nitrogen equipment spread required for flushing the pipeline from the WHP to DCGP for nitrogen preservation is too large to be on the WHP due to the limited deck space and crane limitations. Therefore, a large DP vessel would be required with dedicated hose	Rejected – The size of the equipment spread for the activity outweighs the potential impact of the short-term discharge of treated

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
				management and severance plan. Potential risks on the vessel due to the size of the equipment spread and high POB offshore due to size of vessel required. Increased vessel emissions and discharges during the activity. If nitrogen preservation is completed some time after CoP, there is the potential that the DCGP will be in decommissioning phase and unable to receive pipeline contents (refer below).	seawater to sea.
N/a	If the DC supply pipeline is flushed with treated seawater and requires re-preservation in future as the preservation fluid loses its effectiveness (~3years). Flush the pipeline to DCGP for disposal of treated seawater in evaporation ponds instead of discharge to sea at the WHP end.	Eliminate	Reduction in potential impact from chemicals released to sea	By the time re-preservation is required (~3 years after CoP), the DCGP may already be in decommissioning phase. Therefore, it may be unable to receive and process the treated seawater content from the pipeline because • the available pond capacity onshore at DCGP may be limited or unavailable • the plant may be unavailable to process the flushing fluids as equipment is no longer in service • There may be limited or no power to the DCGP • Structural integrity may have reduced as equipment is removed due to dropped object risk or removal from service.	Rejected – The possibility that the DCGP will be unavailable has been assumed as a worst case scenario, and therefore discharge of treated seawater and the WHP must be assumed.
RE-CM-55	Water quality monitoring at discharge location to confirm the concentration of chemicals. A water quality monitoring program will also be developed to	Administration	Confirms the concentrations of chemicals in the discharge and the extent of the area of impact as a result of the treated seawater discharge	Cost of developing and implementing a monitoring program	Adopted- benefit of verifying chemical concentrations and extent of area of impact

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
	verify modelling outputs				

6.8.5 Environmental impact assessment

Receptor	Consequence Level
Treated Seawater Discharge	
Threatened, migratory, or local fauna	Changes to water quality may result in an alteration to marine fauna behaviour. Sensitive receptors that may be impacted include fish at surface, marine turtles and mammals, and seabirds. Any effects on water quality are expected to be within the surface waters only and have no effect on seabed receptors. Marine fauna may transit through the area, and there is one foraging BIA for the whale shark that overlaps the operational area and BIAs for pygmy blue whale and humpback whales as well as wedge tail shearwater and roseate tern breeding BIAs. No physical environments or habitats are identified in the area over which treated seawater discharges are expected to disperse other than open water. Marine fauna species within the vicinity of the discharge location are likely to be transient. If discharge contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and restriction to the surface waters only, and the transient fauna movement—exposure time may not be long enough to cause a toxic effect. Impacts will be temporary, and the area potentially impacted is small compared with the size of the areas used by the species. Therefore, no long-term impacts to the species are expected. No decrease in local population size, area of occupancy of species, loss or disruption of critical habitat or disruption to the breeding cycle of any of the protected matters species is expected. Any effects on water quality are expected to be highly localised and within the surface waters only and have little to no effect on seabed receptors. The consequence level for threatened, migratory or local fauna is considered to be I-Negligible.
Physical environment or habitat	Impacts to water quality that will be experienced in the discharge mixing zone will be localised and will occur only as long as the discharges occur (i.e. no sustained impacts); therefore, recovery will be measured in hours to days. Given the one-off discharge and the highly dispersive waters of the operational area with strong drift current and local scale currents (average and maximum surface current speeds of 0.30 m/s and 2.51 m/s respectively, RPS 2024)), impacts will be limited to short-term water quality impacts. Given the temporary (within hours to days) minor reduction in water quality, water depth and that the chemicals are inherently biodegradable with low potential for bioaccumulation, it is reasonable to conclude that no substantial change in the benthic communities and water quality is anticipated from the treated seawater discharges and therefore the impact is assessed as acceptable given this is a one-off activity. The consequence level for physical environment or habitat is considered to be I-Negligible.
Threatened ecological communities	Not applicable – No threatened ecological communities are identified in the area over which the treated seawater discharge will disperse.
Protected areas	Not applicable – No protected areas are identified in the area over which the treated seawater discharge will disperse.
Socio-economic receptors	There is limited activity by commercial fishers, recreation and tourism that overlap the operational area. Contact from the short-term discharge of treated seawater will be limited to transient fauna individuals where exposure time will unlikely cause a toxic effect. Given the negligible consequence to species, subsequent impacts to socioeconomic receptors are not anticipated. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. WAFIC stated that it had concerns about the impact of operational discharges associated with IMMR activities on commercial species and the broader marine environment, with specific reference to treated seawater containing scavenger and biocide discharged in the marine environment. WAFIC also requested additional information from Santos on the following: • Monitoring following the discharge of treated seawater • The purpose of environmental monitoring involved in Santos IMMR activity WAFIC also asked if Santos had considered the cumulative impacts of decreased water quality from the proposed activities more broadly on the marine environment Santos responded to all the concerns raised by WAFIC (refer to Table 4-9) and no further concerns were raised.

Receptor	Consequence Level
	The consequence level for the socioeconomic receptors is considered to be I-Negligible
Overall worst-case consequence level	–I-Negligible

6.8.6 Demonstration of ALARP

The use of chemicals to preserve pipelines is a standard technique that is considered critical in maintaining equipment integrity and preventing potential environmental incidents and is unavoidable for the activity. The use of treated seawater is an industry standard and uses chemicals that have been appropriately risk assessed under the Operations Chemical Selection Evaluation and Approval Procedure (EA 91 II 10001).

The volume of discharge will occur in a deep-water location with rapid dispersion. The modelling results predict water quality will return to background levels within 24 hours of completion of discharge. Applying a chemical selection process (see Section 2.11) is an important control measure for reducing the toxicity of discharges to the marine environment. Under the procedure, CHARM-rated gold/silver and non-CHARM Group E/D chemicals managed under the OCNS, or OSPAR PLONOR list, or chemicals risk assessed by Santos and deemed environmentally acceptable, will be selected.

Consideration was given to alternatives such as flushing from the WHP to DCGP to eliminate the potential discharge of treated seawater to sea. However, there is the possibility that the DCGP will already be in decommissioning phase and unable to received the pipeline flushed fluids after CoP has commenced (following the initial flush to clean the pipeline and fill with treated seawater. As this is the worst case scenario, it has been assumed for risk assessment purposes. WAFIC queried whether the toxicity of treated seawater being discharged to the marine environment has been considered and whether modelling and monitoring of the treated seawater discharge would be undertaken. WAFIC also asked if the cumulative impacts of decreased water quality from proposed activities has been considered.

Santos has responded outlining that the toxicity of treated water has been considered and dispersion modelling has been undertaken. Santos has also addressed cumulative impacts and proposes to undertake water quality monitoring at the discharge location to confirm the concentration of chemicals will be carried out. A water quality monitoring program will also be developed to verify modelling outputs. WAFIC responded to Santos outlining that they had no further comments (refer Table 4-9).

The consequence was assessed as I-negligible and cannot be reduced further. Additional control measures were considered but rejected since the associated cost or effort was grossly disproportionate to any benefit, as detailed in Section 6.8.4. Therefore, the impacts of treated seawater discharges are considered ALARP.

6.8.7 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence from treated seawater discharge is I-Negligible
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes –WAFIC stated that it had concerns about the impact of operational discharges associated with IMMR activities on commercial species and the broader marine environment, with specific reference to treated seawater containing scavenger and biocide discharged in the marine environment. WAFIC also requested additional information from Santos on the following:

	• Monitoring following the discharge of treated seawater • The purpose of environmental monitoring involved in Santos IMMR activity WAFIC also asked if Santos had considered the cumulative impacts of decreased water quality from the proposed activities more broadly on the marine environment Santos has responded outlining that the toxicity of treated water has been considered and dispersion modelling has been undertaken. Santos has also addressed cumulative impacts and proposes to undertake water quality monitoring at the discharge location to confirm the concentration of chemicals will be carried out. A water quality monitoring program will also be developed to verify modelling outputs. Santos has considered the potential for cumulative impacts as a result of concurrent vessel operations, treated seawater discharge and IMMR activities. This is presented in Section 6.8.3. WAFIC responded to Santos outlining that they had no further comments (refer Table 4-9). Santos will implement the controls outlined in Section 6.8.4 to demonstrate ALARP.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The release of treated seawater during the activity is required to safely complete the activities, following the preservation of the pipeline. However, water quality and marine fauna impacts will be highly localized to the vicinity of the discharge. The operational area is not located nearby to any sensitive habitat.

The consequence of treated seawater discharges on receptors is assessed as I-negligible. Based on an assessment of Santos' acceptability criteria and with the control measures in place, potential impacts are considered acceptable.

The managed discharges will not reduce the habitat values of the area potentially affected as described in relevant Recovery Plans or Approved Conservation Advice or be inconsistent with the strategies of these documents. Concerns raised by WAFIC during the consultation process regarding the impacts of treated seawater discharge, cumulative impact assessment, monitoring and management were responded to and no further concerns were raised (Table 4-9).Therefore, the negligible impacts expected from the proposed discharge are considered to be environmentally acceptable.

6.9 Spill response operations

The spill response strategies that may be adopted in the event of a hydrocarbon spill have been identified in the OPEP. Potential impacts arising from the implementation of the following spill response operations and actions have been assessed as planned events in this section.

6.9.1 Description of event

Event	In the event of a hydrocarbon spill, response strategies will be implemented to reduce environmental impacts to ALARP. The selection of strategies will be undertaken through the net environmental benefit analysis process, outlined in the OPEP. Spill response will be under the direction of the relevant Control Agency, as defined within the OPEP (Section 4), which may be Santos or another agency or both. In all instances, Santos will undertake a 'first-strike' spill response and will act as the Control Agency until the designated Control Agency assumes control. The response strategies selected as appropriate for the worst-case oil spill scenarios identified for the event are detailed in Table 3-5 of the OPEP and comprise: • Source control • Monitor and evaluate • Mechanical dispersion • Shoreline protection and deflection • Shoreline clean-up • Oiled wildlife response • Scientific monitoring • Waste management. While response strategies are intended to reduce the environmental consequences of a hydrocarbon spill, poorly planned and coordinated response activities can result in a lack of or inadequate information being available, which can lead to poor decisions being made, thereby exacerbating or causing further environmental harm. An inadequate level of training and guidance during the implementation of spill response strategies can also result in environmental harm over and above that already caused by the spill. The greatest potential for impacts additional to those described for routine operations is from shoreline clean-up and oiled wildlife response operations where coastal and shoreline habitat damage and fauna disturbance may occur.
Extent	Extent of spill.
Duration	The spill response effort, as a whole, will exceed the duration of the worst-case spill, due to persistence of the oil in the environment and the requirement to remove this oil and/or monitor impacts and recovery to sensitive receptors. The OPEP provides further detail on the duration of specific response strategies.

6.9.2 Nature and scale of impacts

Nature and scale of environmental impacts	
Light Emissions	
Spill response activities will involve the use of vessels that are required, at a minimum, to display navigational lighting. Vessels may operate in close proximity to shoreline areas during spill response activities. Spill response activities will also involve onshore operations, including the use of vehicles and temporary camps, both of which may require lighting.	
Potential receptors:	Fauna (including threatened, migratory, or local fauna) Protected areas Socio-economic receptors
Lighting may cause behavioural changes in fish and sharks, seabirds and marine turtles that can have a heightened consequence during key lifecycle activities, such as turtle nesting and hatching. Turtles and seabirds, which include threatened and migratory fauna (Table 3-8), have been identified as key fauna susceptible to lighting impacts during spill response activities. Section 6.2 provides further detail on the nature of impacts to fish and sharks, seabirds and marine turtles. Spill response activities that require lighting may take place in protected areas important to turtles. For example, shoreline locations of the Montebello Islands, Muiron Islands and Ningaloo Coast are seasonally important for turtles. During nesting and hatching season (primarily over summer months) lighting may cause behavioural impacts to turtles, including aborted nesting attempts and disorientation of newly hatched turtles, which may increase mortality rates. Spill response activities may also occur on shorelines used by nesting and feeding birds, including seabirds and shorebirds. Lighting can cause disorientation in flying birds, disrupt nesting and breeding behaviours and impact on the ability of birds to forage. Disturbance to feeding migratory shorebirds may reduce their ability to replenish energy reserves and alter the timing and success of migratory flights.	

Nature and scale of environmental impacts	
As a consequence of impacts to fauna, lighting has the potential to directly impact supported industries, such as tourism, and indirectly impact the values of protected areas.	
Noise Emissions	
Spill response activities will involve the use of aircraft and vessels that will generate noise both offshore and in proximity to sensitive receptors in coastal areas. Spill response activities will also involve the use of equipment on coastal areas during shoreline clean-up (e.g. pumps and vehicles), to access shoreline areas (e.g. vehicles) and to support temporary camps (e.g. diesel generators).	
Potential receptors:	Fauna (including threatened, migratory, or local fauna) Protected areas Socio-economic receptors
Underwater noise from the use of vessels may impact marine fauna, such as fish and sharks, marine reptiles and marine mammals, in the worst instance causing physical injury to hearing organs but more likely causing short-term behavioural changes that may impact key lifecycle processes (e.g. spawning, breeding, calving). Underwater noise can also mask communication or echolocation used by cetaceans. Section 3.2.6 provides further detail on these impacts from vessels. Cetaceans have been identified as the key concern for vessel noise within the EMBA. Spill response activities using vessels have the potential to impact fauna in protected areas, including Montebello Marine Park. Noise and vibration from terrestrial activities on shorelines has the potential to cause behavioural disturbance to coastal fauna, including protected and migratory species of shorebirds and turtles. Shoreline activities involving the use of noise-generating equipment may take place in important nesting areas for turtles and roosting or feeding areas for shorebirds. As a consequence of impacts to fauna (including shorebirds, marine mammals, fish and sharks), noise has the potential to impact supported industries, such as tourism and commercial fishing.	
Atmospheric Emissions	
The use of fuels to power vessel engines, generators and mobile equipment used during spill response activities will result in emissions of GHGs, such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), along with non-GHGs, such as sulphur oxides (SO_x) and nitrous oxides (NO_x). Emissions will result in localised decreases in air quality.	
Potential receptors:	Fauna (including threatened, migratory, or local fauna) Physical environment or habitat Protected areas Socio-economic receptors
Atmospheric emissions from spill response equipment will be localised; and while potential exists for fauna and flora impacts, the use of mobile equipment, vessels and vehicles is not considered to create emissions on a scale where noticeable impacts would be predicted. Emissions may occur in protected areas and areas where tourism is important; however, the scale of the impact relative to potential oil spill impacts is not considered great.	
Operational Discharges and Waste	
Operational discharges include those routine discharges from vessels used during spill response and may include: • Deck drainage • Putrescible waste and sewage • Cooling water from operation of engines • Bilge water • Ballast water • Brine discharge. In addition, there are specific spill response discharges and waste creation that may occur, including: • Cleaning of oily equipment, vessels and vehicles • Flushing water for the cleaning of shoreline habitats • Sewage, putrescible waste and municipal waste at camp areas • Creation, storage and transport of oily waste and contaminated organics.	
Potential receptors:	Fauna (including threatened, migratory, or local fauna) Physical environment or habitat Protected areas Socio-economic receptors
Operational discharges from vessels may create a localised and temporary reduction in marine water quality. Effects include nutrient enrichment, toxicity, turbidity, and temperature and salinity increases as detailed in Section 6.6. These may impact a different set of receptors than previously described in that section given vessel use may occur in shallower coastal waters during spill response activities. Discharge could potentially occur adjacent to such marine habitats as corals, seagrass, and	

Nature and scale of environmental impacts	
macroalgae and in protected areas (i.e. receptors anywhere within the EMBA), all of which support a more diverse faunal community; however, discharges will be very localised and temporary. Cleaning of oil-contaminated equipment, vehicles and vessels has the potential to spread oil from contaminated areas to those area not impacted by a spill, potentially spreading the impact area and moving oil into a more sensitive environment. Flushing of oil from shoreline habitats is a clean-up technique designed to remove oil from the receptor that has been oiled and remobilise the oil back into the marine environment, which can result in further dispersion of the oil. The process of flushing has the potential to physically damage shoreline receptors, such as mangroves and rocky shoreline communities, increase levels of erosion; and create an additional, and potentially higher, level of impact than if the habitat was left to bioremediate. Sewage, putrescible waste and municipal waste will be generated from onshore activities at temporary camps, which may include toilet and washing facilities. These wastes have the potential to attract fauna; impact habitats, flora and fauna; and reduce the aesthetic value the environment areas, all of which may be within protected areas. The creation, storage and transport of oily waste and contaminated organics has the potential to spread impacts of oil to areas, habitats and fauna not previously contaminated.	
Physical Presence and Disturbance	
The movement and operation of vessels, vehicles, personnel and equipment and the set-up of temporary camp areas during spill response activities has the potential to disturb the physical environment and marine and coastal habitats and fauna, which may include those habitats and fauna within protected areas. Disturbance may also impact cultural values of an area. The movement of vessels could potentially introduce to nearshore areas invasive marine species attached as biofouling, while vehicle and equipment movement could spread non-indigenous flora and fauna. Oiled wildlife response activities may involve deliberate disturbance (hazing), capture, handling, cleaning, rehabilitation and release of wildlife, which could lead to additional impacts to wildlife.	
Potential receptors:	Fauna (including threatened, migratory, or local fauna) Physical environment or habitat Protected areas Socio-economic receptors
The use of vessels may disturb benthic habitats in coastal waters, including corals, seagrass, macroalgae and mangroves. Impacts to habitats from vessels include damage through the deployment of anchors, chains, and nearshore oil containment booms and from grounding. Vessel use in shallow coastal waters also increases the chance of contact or physical disturbance with marine megafauna, such as turtles and dugongs. Booms create a physical barrier on the surface waters that has the potential to injure or entangle passing marine fauna that are either surface breathing or surface feeding. Vehicles, equipment and personnel used during shoreline response activities have the potential to damage such coastal habitats as dune vegetation, mangroves and habitats important to threatened and migratory fauna and to damage nests of turtles and birds and bird roosting or feeding areas. Shoreline clean-up may involve the physical removal of substrates that could cause impact to habitats and coastal hydrodynamics and alter erosion or accretion rates. The presence of camp areas, although relatively short-term, may disrupt normal behaviour of such coastal species as shorebirds and turtles and could potentially interfere with nesting and feeding behaviours. Oiled wildlife response may include the hazing, capture, handling, transportation, cleaning and release of wildlife susceptible to oiling, such as birds and marine turtles. While oiled wildlife response is aimed at having a net benefit, poor response can potentially create additional stress and exacerbate impacts from oiling, interfering with lifecycle processes, hampering recovery and, in the worst instance, increasing levels of mortality. Impacts and risks from invasive marine species are described in Section 7.1 and are not described further in this section. Impacts from invasive terrestrial species (e.g. weeds) are similar to those of invasive marine species in that the invasive species can outcompete local species and interfere with ecosystem processes. Non-native species may be transported attached to equipment, vehicles and clothing. Such an introduction would be especially detrimental to wilderness areas or protected terrestrial reserves, which may have a relatively undisturbed flora and fauna community. The disturbance to marine and coastal natural habitat, as well as the potential for disruption to culturally sensitive areas, which may occur in specially protected areas, may have flow-on impacts to socio-economic values and industry (e.g. tourism, fisheries).	
Disruption to Other Users of Marine and Coastal Areas and Townships	
Spill response activities may involve the use of vessels, equipment and vehicles and the establishment of temporary camps in areas used by the general public or industry. The mobilisation of spill response personnel into an affected area may also place increased demands on local accommodation and other businesses.	
Potential receptors:	Socio-economic receptors
The use of vessels in the nearshore and offshore environment and the undertaking of spill response activities at shoreline locations may exclude general public and industry use of the affected environment. As well as impacting leisure activities of the general public, this may impact on revenue with respect to such industries as tourism and commercial fishing. The mobilisation of personnel to small communities has the potential to affect the local community through demands on local accommodation and business, reducing the availability of services to members of the public.	

6.9.3 Environmental performance and control measures

Environmental Performance Outcomes (EPOs), control measures, Environmental Performance Standards (EPSs) and measurement criteria for spill preparedness and response activities are outlined within the relevant strategy sections of the OPEP. Control measures relevant to reducing the potential impacts from spill response operations are shown in Table 6-25 below.

Table 6-25: Reducing potential impacts from spill response operations

Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
Competent Incident Management Team (IMT) and oil spill responder personnel.	Ensures that spill response strategy selection and activities consider the potential for additional environmental impacts.	Personnel and operational costs associated with maintaining competent IMT team and responder personnel.	Adopted – Considered a standard spill response control.
Use of competent vessel crew and personnel.	Reduces potential for environmental impacts from vessel usage.	Personnel and operational costs associated with maintaining contracts with competent vessel crew and personnel.	Adopted – Considered a standard spill response control.
Spill response activities selected on basis of a NEBA	Provides a systematic and repeatable process for evaluating strategies with net least environmental impact.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control.
Noise emissions			
Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003).	Reduces potential for behavioural disturbance to cetaceans.	No cost/issue associated with this control measure	Adopted – Ensures compliance with Part 8 of the EPBC Regulations 2000, which is considered a standard spill response control (regulatory requirement).
Light Emissions			
Select temporary base camps in consultation with DoT and DBCA.	Reduce coastal habitat and fauna disturbance.	No cost/issue associated with this control measure.	Adopted – Considered a standard control to be adopted by the relevant Control Agency.
Atmospheric Emission			
International Air Pollution Prevention (IAPP) Certificate	Reduces level of air quality impacts.	Personnel and operational costs associated with maintaining Air Pollution Certificate.	Adopted – Considered a standard spill response control (regulatory requirement).
Disruption to Other Marine Users			
Stakeholder consultation	Promotes awareness and reduces potential impacts from response to socio-economic activities	Minimal cost in relation to overall effort/costs in managing incident	Adopted – Considered a standard control for incident management
Utility resource assessment and support to be conducted if activity is of significant size in comparison to the size of the coastal community	Reduces potential impact due to higher utility demands causing disruptions to local community.	No cost / issue associated with this control measure.	Adopted – Considered a standard control.
Accommodation assessment	Reduces strain on accommodation.	No cost / issue associated with this control measure.	Adopted – Considered a standard control.
Transport Management Plan	Reduces potential for traffic disruptions.	No cost / issue associated with this control measure.	Adopted – Considered a standard control for large-scale deployment in highly populated areas.

Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
Operational Discharges and Waste			
Vessels meet applicable MARPOL and Marine Park sewage disposal requirements	Reduces potential for water quality impacts.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control (regulatory requirement).
Vessel meet applicable requirements for oily water (bilge) discharges	Reduces potential for water quality impacts.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control (regulatory requirement).
Ballast Water Management Plan	Improve quality of water discharged to marine environment to ALARP.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control (regulatory requirement).
Approved oily water decanting	Reduces impact from discharge of oily water from storage. Frees up space in liquid waste containers to allow further waste collection.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control (regulatory requirement).
Compliance with controlled waste, unauthorised discharge and landfill regulations.	Ensures correct handling and disposal of oily wastes.	No cost/issue associated with this control measure.	Adopted – Considered a standard spill response control (regulatory requirement).
Physical Presence and Disturbance			
Spill response activities selected on basis of a net environmental benefit analysis.	Provides a systematic and repeatable process for evaluating strategies with net least environmental impact.	No cost/issue associated with this control measure	Adopted – Considered a standard spill response control.
Vessels and aircraft compliant with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003).	Reduces potential for behavioural disturbance to cetaceans.	No cost/issue associated with this control measure	Adopted – Ensures compliance with Part 8 of the EPBC Regulations 2000, which is considered a standard spill response control (regulatory requirement).
Use of shallow draft vessels for shoreline and nearshore operations.	Reduce seabed and shoreline disturbance.	Operational costs associated with operating shallow draft vessels for shoreline and nearshore operations.	Adopted – Considered a standard control.
OSR Team Leader assesses and selects vehicles appropriate to shoreline conditions.	Reduce coastal habitat and fauna disturbance.	No cost/issue associated with this control measure.	Adopted – Considered a standard control.
Conduct shoreline, nearshore habitat, bathymetry assessment.	Reduce shoreline habitat disturbance.	Operational costs associated with conducting shoreline nearshore habitat assessment.	Adopted – Considered a standard control.
Establish demarcation zones for vehicle and personnel movement considering sensitive vegetation, bird nesting and roosting areas and turtle nesting habitat.	Reduce coastal habitat and fauna disturbance.	No cost/issue associated with this control measure.	Adopted – Considered a standard control.

Control Measure	Environmental Benefit	Potential Cost/Issues	Evaluation
Operational restriction of vehicle and personnel movement to limit erosion and compaction.	Reduce coastal habitat erosion and compaction.	No cost/issue associated with this control measure.	Adopted – Considered a standard control.
Prioritise use of existing roads and tracks.	Reduce coastal habitat and fauna disturbance.	No cost/issue associated with this control measure.	Adopted – Considered a standard control.
Select temporary base camps in consultation with DoT and DBCA	Reduce coastal habitat and fauna disturbance.	No cost/issue associated with this control measure.	Adopted – Considered a standard control to be adopted by the relevant Control Agency.
Soil profile assessment prior to earthworks.	Reduce habitat disruption and erosion.	Operational costs associated with soil profile assessment.	Adopted – Considered a standard control.
Use of Heritage Advisor if spill response activities overlap with potential areas of cultural significance.	Reduce disturbance to culturally significant sites.	No cost/issue associated with this control measure.	Adopted – Considered a standard control to be adopted by the relevant Control Agency.
Pre-cleaning and inspection of equipment (quarantine)	Reduces potential for invasive species to offshore islands	Cost/effort in inspecting equipment	Adopted – Considered a standard control.
Adhere to WA Oiled Wildlife Response Plan and Pilbara Regional Oiled Wildlife Response Plan	Oiled wildlife hazing, capture, handling and rehabilitation meet minimum standards as outlined within the WA Oiled Wildlife Response Plan.	Operational costs associated with response plan.	Adopted – Considered a standard control to be adopted by the relevant Control Agency.

6.9.4 Environmental impact assessment

Receptor	Consequence Level
Spill Response Operations – Light Emissions	
Threatened, migratory, or local fauna Physical environment or habitat Threatened ecological communities Protected areas Socio-economic receptors	The receptors considered most sensitive to lighting from vessel and shoreline operations are seabirds, shorebirds and marine turtles, particularly over summer months with respect to marine turtles where emerging hatchlings are sensitive to light spill onto beaches. Following restrictions on night-time operations by spill response vessels, which will demobilise to mooring areas offshore with safety lighting only, impacts from vessels are considered to be I Negligible. Temporary camps will be positioned at the direction of DoT or DBCA and control measures on lighting colour and direction will be followed; therefore, the consequence of shoreline lighting is considered Negligible. These species are likely to be values of the protected area they occur in (e.g. Montebello Islands, Ningaloo), and the impact to the protected area from light is also considered Negligible. As a consequence of impacts to fauna, lighting has the potential to impact supported industries, such as tourism; however, as impacts to fauna are considered negligible, any indirect impacts on tourism will also be Negligible. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
Overall worst-case consequence level	I – Negligible
Spill Response Operations – Noise emissions	
Threatened, migratory, or local fauna Physical environment or habitat	The receptor considered most sensitive to vessel noise disturbance is the humpback whale during migration season, when these whales come close to the Montebello Islands and Barrow Island during their peak migration (July to October), as well as populations of marine turtles, whale sharks and pygmy blue whales. However, following the adoption of control measures to

Receptor	Consequence Level
Threatened ecological communities Protected areas Socio-economic receptors	limit close interaction with protected fauna (i.e. Protected Marine Fauna Interaction and Sighting Procedure (EA-91-II-00003)), a temporary behavioural disturbance is expected only with a consequence of Negligible. With respect to noise from onshore operations (mobile equipment and vehicles), nesting, roosting or feeding birds are considered to be the most sensitive to noise, in particular shorebirds that may be aggregating at Montebello Islands, Barrow Island and the Ningaloo coast. The equipment used is not considered to have excessive sound levels and, following direction by DoT and DBCA on the location of temporary camp areas, the consequence to birds from noise is expected to be Negligible. Shorebirds may be official values of the protected area they occur in, and the impact to the protected area from noise is also considered *Negligible*. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
Overall worst-case consequence level	I – Negligible
Spill Response Operations – Atmospheric Emissions	
Threatened, migratory, or local fauna Physical environment or habitat Threatened ecological communities Protected areas Socio-economic receptors	Atmospheric emissions from spill response equipment will be localised; and impacts to even the most sensitive fauna, such as birds, are expected to be Negligible. Because the emissions will be localised and low level, impacts to protected area values, physical environment and socio-economic receptors are predicted to be Negligible. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
Overall worst-case consequence level	I – Negligible
Spill Response Operations – Operational Discharges and Waste	
Threatened, migratory, or local fauna Physical environment or habitat Threatened ecological communities Protected areas Socio-economic receptors	Operational discharges from vessels may create a localised and temporary reduction in marine water quality, which has the potential to impact shallow coastal habitats in particular; however, following the adoption of regulatory requirements for vessel discharges, which prevent discharges close to shorelines, discharges will have a *Negligible* impact to habitats, fauna or protected area values. Furthermore, washing of vessels and equipment will take place only in defined offshore hot zones preventing impacts to shallow coastal habitats. As a consequence of impacts to fauna, operational discharges from vessels has the potential to impact supported industries, such as tourism and commercial fishing; however, as impacts to fauna are considered I – Negligible, any indirect impacts on socio-economic receptors will also be *Negligible*. Onshore, the use of flushing water has the potential to damage sensitive shoreline and intertidal habitats, e.g. mangroves; however, low-pressure flushing only will be used, preventing further damage to habitats or erosion of sediments. For sensitive habitats, the deployment of booms will be considered to retain flushed hydrocarbons, if this presents a net benefit. Following these control measures, the use of flushing to clean shorelines and intertidal habitats is seen to have a *Negligible* additional impact to habitats, fauna or protected area values. The cleaning of contaminated vehicles and equipment onshore has the potential to spread oily waste and damage habitats if not contained. Decontamination units will be in used during the spill response, thus containing waste and preventing any secondary contamination. The consequence of cleaning discharges is therefore ranked as I – Negligible in terms of impacts to habitats, fauna or protected area values. Sewage, putrescible waste and municipal waste generated onshore will be stored and disposed of at approved locations. The storage, transport and disposal of hydrocarbon-contaminated waste arising from spill response operation actions, such as containment and recovery and shoreline clean up, will be managed by Santos' appointed waste management contractor; and dedicated waste containment areas will prevent the spreading or leaching of hydrocarbon contamination. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. The consequence of operational discharges is therefore ranked as I – Negligible in terms of impacts to habitats, fauna or protected area values.
Overall worst-case consequence level	I – Negligible

<table>
<tr><th>Receptor</th><th>Consequence Level</th></tr>
<tr><td colspan="2">Spill Response Operations – Physical Presence and Disturbance</td></tr>
<tr><td>Threatened, migratory, or local fauna</td><td rowspan="5">The use of vessels and nearshore booms has the potential to disturb benthic habitats, including sensitive habitats in coastal waters, such as corals, seagrass, macroalgae and mangroves. A review of shoreline and shallow water habitats and of bathymetry and the establishment of demarcated areas for access and anchoring (along with other control measures in Section 6.5) will reduce the level of impact to I -Negligible.
The use and movement of vehicles, equipment and personnel during shoreline response activities has the potential to disturb coastal habitats, such as dune vegetation, samphire and mangroves, and important habitats of threatened and migratory fauna, including nests of turtles and birds and bird roosting areas. Furthermore, clean-up can involve physical removal of substrates that could impact habitats and fauna and alter coastal hydrodynamics. As with vessel use, an assessment of appropriate vehicles and equipment to reduce habitat damage, along with the establishment of access routes, demarcation zones, and operational restrictions on equipment and vehicle use, will limit sensitive habitat damage and damage to important fauna areas. The establishment of temporary camp areas will be done under direction of DoT and DBCA with suitable advice sought if access is needed to culturally significant areas. Following these and other control measures, the resultant consequence to the physical environment and habitat is assessed as Minor, indicating that there may be a detectable reduction in habitat area from response activities (as separate from spill impacts), but recovery will be relatively rapid once spill response activities cease. As with all spill response activities, this disturbance will only occur if there is a net benefit to accessing and cleaning shoreline areas.
The main direct disturbance to fauna would be the hazing, capture, handling, transportation, cleaning and release of wildlife susceptible to oiling impacts, such as birds and marine turtles. This would only be done if this intervention were to deliver a net benefit to the species, but it may result in a Minor consequence following compliance with the WA Oiled Wildlife Response Plan and the Pilbara Region Oiled Wildlife Response Plan.
EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
These habitats or environments are likely to be values of the protected area they occur in, and the impact to the protected areas from physical disturbance is therefore also considered Minor.
The disturbance to marine and coastal natural habitat, as well as the potential for disruption to culturally sensitive areas, which may occur in specially protected areas, may have flow-on impacts to socio-economic values and industry (e.g. tourism, fisheries). This impact is considered II -Minor.</td></tr>
<tr><td>Physical environment or habitat</td></tr>
<tr><td>Threatened ecological communities</td></tr>
<tr><td>Protected areas</td></tr>
<tr><td>Socio-economic receptors</td></tr>
<tr><td>Overall worst-case consequence level</td><td>II – Minor</td></tr>
<tr><td colspan="2">Spill Response Operations – Disruption to Other Users of Marine and Coastal Areas and Townships</td></tr>
<tr><td>Threatened, migratory, or local fauna</td><td rowspan="5">The use of vessels in the nearshore and offshore environment and spill response activities at shoreline locations and within townships may exclude general public and industry use. Note that this is distinct from the socio-economic impact of a spill itself, which would have a far greater detrimental impact to industry and recreation.
EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.
Following the application of control measures, it is considered that the additional impact of spill response activities on affected industries would be II – Minor.</td></tr>
<tr><td>Physical environment or habitat</td></tr>
<tr><td>Threatened ecological communities</td></tr>
<tr><td>Protected areas</td></tr>
<tr><td>Socio-economic receptors</td></tr>
<tr><td>Overall worst-case consequence level</td><td>II – Minor</td></tr>
</table>

6.9.5 Demonstration of ALARP

A net environmental benefit analysis is the primary tool used during spill response to evaluate response strategies with the goal of selecting strategies that result in the least net impact to key environmental sensitivities. The net environmental benefit analysis process conducted as a spill occurs will identify and compare net environmental benefits of alternative spill response options. The analysis will effectively determine whether an environmental benefit will be achieved through implementing a response strategy compared to undertaking no response. The analysis will be undertaken by the relevant Control Agency for the activity. For those activities under the control of Santos, the Environment Team Leader will be responsible for reviewing the priority receptors and selected response strategies identified within the OPEP and coordinating the net environmental benefit analysis for each operational period. This will ensure that, at the strategy level, the response operations reduce additional environmental impacts to ALARP.

Spill response activities will be conducted in offshore and coastal waters, using vessels and aircraft. The greatest potential for additional impacts from implementing spill response is considered to be to wildlife in offshore waters from oiled wildlife response activities and to shoreline habitats and fauna receptors within shallow waters or on shorelines from shoreline clean-up activities.

Given the types of activities considered appropriate to responding to a worse-case spill and the scale of operations, the standard control measures adopted by Santos for spill response to reduce the level of additional impacts are considered to reduce these impacts to ALARP. This includes working with the relevant Control Agency for spill response and applying the processes and standards; e.g. for oiled wildlife response as included in the WA Oiled Wildlife Response Plan.

Santos has considered the actions prescribed in the Recovery Plan for Marine Turtles in Australia (CoA, 2017) and approved conservation advice for other relevant threatened fauna relevant to spill responses for the activities to minimise noise and light impacts on marine cetaceans, fish, sharks and marine turtles, especially flatback turtles. The proposed activity will not result in significant impacts on these species, and implementation of identified control measures is in line with the relevant conservation advice and recovery plans. Pollution events (such as hydrocarbon spills) could impact on fauna, and the use of vessels and equipment during the spill response could result in potential impacts as described in this EP. Control measures in place for vessel and helicopter use as provided in Section 6.2 will reduce potential impacts to marine fauna, and these are consistent with current conservation advice. The assessed residual consequence for this impact is *Minor* and cannot be reduced further without grossly disproportionate costs. It is considered therefore that the impact of the activities conducted is ALARP.

6.9.6 Acceptability evaluation

Is the consequence ranked as I (Negligible) or II (Minor)?	Yes – Maximum consequence is II (Minor).
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – IUCN principles of nearby reserves (Montebello Australian Marine Park and the MPNMP) are met (Section 3.2.5). Control measures implemented will minimise the potential impacts from spill response activities to protected areas and their values and to species identified in recovery plans and conservation advice as having the potential to be impacted. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised by stakeholders for this event. During any spill response, a close working relationship with relevant regulatory bodies (e.g. DoT, DBCA, AMSA, and Director of National Parks) will occur, and thus there will be ongoing consultation with relevant stakeholders on the acceptability of response operations. Wildlife response will be conducted in accordance with the WA Oiled Wildlife Response Plan.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The implementation of response activities to reduce the potential impacts from a spill are required by legislation. The spill response options selected have been demonstrated to show a net environmental benefit, are standard industry practice, and are consistent with relevant standards and guidelines, including the National Plan for Maritime Environmental Emergencies (AMSA, 2020). No concerns from stakeholders have been raised regarding response activities, and the controls proposed reduce the consequences of the potential impacts to Minor (II) and ALARP. The controls used during spill response activities are therefore considered to reduce additional impacts and risks to an acceptable level.

7. Environmental assessment for unplanned events

OPGGS(E)R 2023 Requirements
Regulation 21(5)
The environment plan must include: a) details of the environmental impacts and risks of the activity; and b) an evaluation of all the environmental impacts and risks, appropriate to the nature and scale of each impact or risk; and c) details of the control measures that will be used to reduce the impacts and risks of the activity to as low as reasonably practicable and an acceptable level.
Regulation 21(6)
To avoid doubt, the evaluation mentioned in paragraph (5)(b) must evaluate all of the environmental impacts and risks arising directly or indirectly from: a) all operations of the activity; and b) any potential emergency conditions, whether resulting from an accident or any other cause.
Regulation 21(7)
The environment plan must: a) set environmental performance standards for the control measures identified under paragraph (5)(c); and b) set out the environmental performance outcomes for the activity against which the performance of the titleholder in protecting the environment is to be measured; and c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

Two ENVID workshops (as described in Section 5) for planned and unplanned activities were held on 30 April 2024 and 02 May 2024, covering both the Reindeer and Devil Creek facilities. This workshop identified potential sources of environmental impact associated with the unplanned events for this activity. The consequence rankings resulting from the environmental assessments are summarised in Table 7-1. A comprehensive risk and impact assessment for each of the unplanned events, and subsequent control measures proposed by Santos to reduce the risk and impacts to ALARP and acceptable levels are detailed in the following subsections

Table 7-1: Summary of the risk assessment ranking for unplanned activities

EP Section	Event	Consequence	Likelihood	Residual risk ranking
7.1	Introduction of invasive marine species	IV – Major	B – Unlikely	Low
7.2	Marine fauna interaction	II – Minor	C – Possible	Low
7.3	Release of solid objects (large items)	II – Minor	B – Unlikely	Very Low
	Release of solid objects (small items)	I – Negligible	C – Possible	Very Low
7.4	Hazardous liquid releases	I – Negligible	B – Unlikely	Very Low
7.6	Surface release of condensate from the WHP	III – Moderate	A – Remote	Very Low
7.7	Subsea release of condensate from DC supply pipeline	II – Minor	A – Remote	Very Low
7.8	Surface release of diesel	III – Moderate	B – Unlikely	Low
	Surface release of diesel (refuelling)	II – Minor	B – Unlikely	Very Low
7.9	Unplanned release of treated seawater	I-Negligible	A-Remote	Very Low
7.10	Unplanned release of nitrogen	I-Negligible	A-Remote	Very Low

7.1 Introduction of invasive marine species

7.1.1 Description of event

Event	Introduction of invasive marine species may occur due to: • Biofouling on support vessels and external or internal (e.g. sea chests, seawater systems) niches • Biofouling on equipment that is routinely submerged in water (e.g. mooring lines, ROVs) • Discharge of high-risk ballast water • Cross-contamination between vessels. Once established, invasive marine species have the potential to outcompete indigenous species and affect overall ecosystem function.
Extent	Localised (seabed within the operational area) to widespread (if successfully translocated to new areas via ocean currents or project equipment transit).
Duration	Temporary to long-term (in the event of successful translocation and establishment).

7.1.2 Nature and scale of impacts

<u>Potential receptors: Physical environment (benthic habitats), threatened/migratory fauna (marine mammals, marine reptiles, sharks, fish, and rays), protected areas, socio-economic receptors (fisheries, tourism, and recreation) and cultural aspects (sea country, potential for totemic species).</u>

Invasive marine species are marine plants, animals and algae that have been introduced into a region that is beyond their natural range and have the ability to survive and possibly thrive (DAFF, 2011). The majority of climatically compatible invasive marine species of the North West Shelf are found in Southeast Asian countries.

Some invasive marine species pose a significant risk to environmental values, biodiversity, ecosystem health, human health, fisheries, aquaculture, shipping, ports and tourism (Wells *et al*., 2009; DAFF, 2011). When invasive marine species achieve pest status, they are commonly referred to as introduced marine pests and can cause a variety of adverse effects in a receiving environment, including:

- Over predation of native flora and fauna
- Outcompeting of native flora and fauna for food
- Human illness through released toxins
- Depletion of viable fishing areas and aquaculture stock
- Reduction of coastal aesthetics
- Damage to marine and industrial equipment and infrastructure.

The above impacts can result in flow-on detrimental effects to fisheries, tourism, and recreation. Invasive Marine Species(IMS) of concern are those that are not native to the region, are likely to survive and establish in the region, and are able to spread by human-mediated or natural means.

IMS of concern are those that are not native to the region, are likely to survive and establish in the region, and are able to spread by human mediated or natural means. Species of concern vary from one region to another depending on various environmental factors, such as water temperature, salinity, nutrient levels, and habitat type. These factors dictate their survival and invasive capabilities.

It is recognised that artificial, disturbed and/or polluted habitats in tropical regions are susceptible to invasive marine species introductions, which is why ports are often areas of higher IMS risk (Neil et al., 2005). However, in Australia there are limited records of detrimental impact from IMS compared to other tropical regions (such as the Caribbean). Following their establishment, eradication of IMS populations is difficult, limiting management options to ongoing control or impact minimisation. Case studies in Australia indicate that, from detection to eradication, this can take around four weeks (Bax et al., 2003). However, this depends on the environmental conditions and species. For this reason, increased management requirements have been implemented in recent years by Commonwealth and State regulatory agencies.

Ballast water is responsible for 20–30% of all marine pest incursions into Australian waters. However, research indicates that biofouling (the accumulation of aquatic micro-organisms, algae, plants and animals on vessel hulls and submerged surfaces) has been responsible for more foreign marine introductions than ballast water (DAFF, 2003). The potential biofouling risk presented by vessels will relate to:

- the length of time that these vessels have already been operating in Australian waters or, if they have been operating outside Australian waters

- the locations of the operations they have been undertaking
- the length of time spent at these locations
- whether the vessels have undergone hull inspections, cleaning, and application of new anti-foulant coating prior to returning to operate in Australia.

Most IMS are found in tidal and subtidal zones, with only a few species known to extend into deeper waters of the continental shelf (Bax et al., 2003). Further, it is known that highly disturbed environments (such as marinas and jetties) are more susceptible to colonisation than open-water environments where the number of dilutions and the degree of dispersal are high (Paulay et al., 2002).

Potential sources for the introduction of marine species into the operational area include biofouling on the support vessels, including external niches (e.g. propulsion units, steering gear and thruster tunnels) and internal niches (e.g. sea chests, strainers, seawater pipe work, anchor cable lockers and bilge spaces).

Equipment that is submerged in water for periods of time (e.g. AUVs and ROVs) may acquire marine pest species, which can be spread if the equipment is not cleaned prior to use in pest-free areas.

Support vessels based in local ports, such as Dampier or Onslow, do not carry the same quarantine risks as international vessels (e.g. offtake tankers) or out of State vessels, as they supply the same waters as those the operational area resides in. Given the depths at the Reindeer facilities, establishment may not occur on the seabed; however, there is potential for invasive marine species to establish on WHP infrastructure and on the sections of the DC pipeline in shallower waters (38 m) at the CSB,.

7.1.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- No introduction of marine pest species [EPO-RE-06].

The control measures considered for this activity are shown in Table 7-2, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-2: Control measures evaluation for Introduction of invasive marine species

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Costs/Issues	Evaluation
Standard Controls					
RE-CM-38	Implementation of the management controls in the Santos Invasive Marine Species Management Plan (IMSMP)	Administrative	The risk of introducing IMS is reduced due to assessment procedure and management of ballast water.	Personnel costs involved in risk assessing vessels in accordance with the Invasive Marine Species Management Plan. Costs associating with reducing the vessel risk to 'low' (for example, dry docking, hull cleaning or additional costs due to inspections). Could lead to potential delays and therefore costs in vessel contracting process due to unavailability of vessels.	Adopted – Minimal personnel costs and potential delays or costs to activity are considered outweighed by the benefits of reducing the risk of IMS.
RE-CM-39	Anti-foulant system.	Protective	The risk of introducing invasive marine species is reduced due to anti-foulant systems.	Could lead to potential delays and therefore costs in vessel contracting process due to unavailability of vessels with appropriate anti-foulant systems.	Adopted – Minimal potential delays or costs to project are considered outweighed by the benefits of reducing the risk of invasive marine species.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Costs/Issues	Evaluation
Additional Control Measures					
N/A	Heat treatment of ballast water to eliminate invasive marine species.	Protective	Would reduce potential for invasive marine species to establish by eliminating individuals present in ballast water.	High cost compared to existing risk; introduction of water at much higher temperature than surrounding marine environment would likely result in death of native marine species.	Rejected – Based on increased risk to marine environment compared to base case risk.
NA	Restrict vessel operations to using vessels and equipment that have only operated in local, State or Commonwealth waters to reduce potential for invasive marine species.	Administrative	Reduce potential for IMS to be transported into area since vessels would not have originated elsewhere.	Vessels and equipment suitable for the activity that have only operated in local, State or Commonwealth waters may not be available; therefore, work could not be completed.	Rejected – Not feasible.
NA	Mandatory dry docking of vessels prior to entering field to clean vessel and equipment and remove biofouling.	Eliminate	Ensure that no IMS are present on vessel or associated equipment.	Significant cost (grossly disproportionate to the risk); would lead to scheduling delays.	Rejected – Costs disproportionately high compared to environmental benefit given that other controls in place already reduce the risk.
NA	Use an alternative ballast system to avoid uptake or discharge of water.	Substitute	Eliminate need for ballast water exchange, therefore decreasing risk of introducing IMS through ballast water.	Vessels suitable for the activity may not have options for alternative ballast system, therefore would require modification at significant cost.	Rejected – Costs disproportionately high compared to environment benefit.
N/A	Zero discharge of ballast water.	Eliminate	Would reduce the potential for invasive marine species by implementing a no ballast water exchange policy on support vessels.	Ballast water exchange required on the support vessels for stability.	Rejected – On the basis that ballast water exchange is a safety-critical activity for marine operations.

7.1.4 Environmental impact assessment

Description – Invasive Marine Species	
Receptors	Physical environment (benthic habitats) Threatened, migratory and local fauna (marine mammals, marine reptiles, sharks, fish, and rays) Socio-economic receptors (fisheries, tourism, and recreation) Cultural aspects (Sea Country, potential for totemic species)
Consequence	IV – Major.
Ballast water is responsible for 20–30% of all marine pest incursions into Australian waters. However, research indicates biofouling (the accumulation of aquatic micro-organisms, algae, plants and animals on vessel hulls and submerged surfaces) has been responsible for more foreign marine introductions than ballast water (DAFF, 2003). IMS, if successfully established, can outcompete native species for food or space, prey on native species or change the nature of the environment and can subsequently impact on fisheries or aquaculture.	

Description – Invasive Marine Species	
If an IMS is introduced, the species has been known to colonise areas outside of the areas to which it is introduced. In the event an IMS is introduced into the operational area, given the lack of diversity and extensiveness of similar benthic habitat in the region, there would only be a minor reduction in the physical environment. No threatened ecological communities are present in the area that could be affected. The overall consequence level was assessed as Major, this also takes into consideration the distance of the activity to protected areas (>32 km from Montebello AMP) and the requirements of the North-West MPNMP which applies adjacent to the operational area which requires that vessel ballast water exchange is completed in accordance with the Australian Ballast Water Management Requirements. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.	
Likelihood	B – Unlikely.
The pathways for IMS introduction are well known; consequently, standard preventive measures are proposed. The ability for invasive marine species to colonise a habitat depends on a number of environmental conditions. It has been found that highly disturbed environments (such as marinas) are more susceptible to colonisation than are open water environments where the number of dilutions and the degree of dispersal are high (Paulay et al., 2002). Invasive marine species are more likely to populate shallower areas with favourable substrates. Given that the depth of the operational area (~38–59 m) creates an unfavourable habitat for colonisation (i.e. light limiting and low habitat biodiversity with sparse epibiota) and that it is distant from shallow coastal habitats, there is a very low likelihood that invasive marine species would be able to survive translocation and subsequently establish and colonise. With control measures in place to reduce the risk of introduction of invasive marine species, the likelihood of introducing an invasive marine species is considered B -Unlikely.	
Residual Risk	Low.

7.1.5 Demonstration of ALARP

Support vessels are required for the safe and efficient operation of the Reindeer facilities. Without vessels providing support for activities via replenishment of materials and subsea inspections, the risk of equipment failure leading to a safety or environmental incident is increased. Therefore, eliminating subsea equipment inspection activities or supply transfer to eliminate the risk of introducing invasive marine species is not considered practicable.

Ballast water exchange will be managed through Ballast Water Management actions consistent with the Australian Ballast Water Management Requirements and a vessel biosecurity risk assessment in accordance with the Invasive Marine Species Management Plan (EA-00-RI-10172) which aligns with IMO 2023 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (Biofouling Guidelines 2023) and the Biosecurity Act 2015 to demonstrate that vessels are low risk so that IMS are not introduced.

The frequency of materials transfers has been scheduled to ensure the optimal safe and efficient operation of the WHP. A reduction in the frequency of material supply is possible; however, this would require an increased holding capacity of such consumables as diesel and chemicals, increasing the risk of a larger hydrocarbon or chemical spill and the risk from use of larger vessels. Therefore, reducing this frequency is not practicable. In addition, the frequency of subsea inspections has been scheduled for the safe operational duration to proactively prevent equipment failure based on the Company's experience on the North West Shelf. Smaller vessels are more likely to be sourced locally, reducing the potential for invasive marine species presence. Therefore, the frequency of vessels required in the field is considered ALARP, based on the required safe operation and maintenance requirements of the platform and DC supply pipeline.

Ballast water exchange will be managed through a Ballast Water Management Plan, and a vessel biosecurity risk assessment in accordance with the Invasive Marine Species Management Plan (EA-00-RI-10172) will be undertaken to demonstrate that vessels are low risk so that IMS are not introduced.

Santos has adopted a risk-based approach to managing biofouling given it is not practicable or reasonable to inspect and/or clean every vessel before each voyage. Such an approach is consistent with other petroleum operators on the North West Shelf and is beyond that enforced on the majority of commercial and recreation vessels that regularly transit the same bioregion. International vessels are given the highest priority to prevent the introduction of IMS into Australian waters. However, domestic vessels (interstate and locally sourced) are also risk-assessed to reduce the likelihood of spreading marine pest species already established in Australian waters. The biofouling risk assessment approach adopted by Santos will ensure that the Aquatic Resources Management Act 2016[5], Biosecurity Amendment (Biofouling Management Regulations 2021) and other associated regulations prohibiting the introduction of non-endemic fish species will be met.

No other controls were identified to reduce the risk of introducing invasive marine species. Therefore, with the above control measures in place, the risk of introducing invasive marine species has been reduced to ALARP.

7.1.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Introduction of invasive marine species residual risk ranking is Low.
Is further information required in the consequence assessment?	No – Potential impacts and risks well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – management consistent with *Biosecurity Act 2015,* Biosecurity Amendment (Biofouling Management Regulations 2021), National Biofouling Management Guidance for the Petroleum Production and Exploration Industry (Marine Pest Sectoral Committee, 2018) and the *Aquatic Resources Management Act 2016*
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos' Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – see ALARP above.

The mobilisation of vessels and equipment to undertake offshore petroleum activities is industry standard practice, and the IMS risks are well understood and subject to regulation. The vessels and equipment that are internationally mobilised will meet Australian biosecurity requirements, and proposed management is consistent with National Biofouling Management Guidance for the petroleum Production and Exploration Industry (Marine Pest Sectoral Committee, 2018) and Australian Biofouling Management Requirements (DAFF, 2023).

Application of the proposed control measures and adherence to legislation and regulations reduce the likelihood of introducing IMS into the operational area, and the dispersive offshore location in the operational area reduces the probability of successful establishment in the unlikely event of introduction.

No stakeholder concerns have been raised regarding this aspect, and the proposed controls will reduce the residual level of risk to medium and ALARP. Therefore, the residual risk associated with IMS is considered ' to be environmentally acceptable.

7.2 Marine fauna interaction

7.2.1 Description of event

Event	There is the potential for vessels or equipment (e.g. ROV) involved in activities for operations, IMMR and CoP to interact with marine fauna, including potential strike or collision potentially resulting in severe injury or mortality. Fauna strike may also occur from helicopter or unmanned aerial vehicles collision, during take-off and landing.
Extent	Within the operational area, in the immediate vicinity of support vessels, subsea equipment or helicopters, while moving.
Duration	When undertaking vessel and helicopter operations during operations, IMMR and CoP activities.

7.2.2 Nature and scale of impacts

<u>Potential receptors: Threatened or migratory fauna (marine mammals, marine turtles, sharks and rays, fish, and birds).</u>

Movement of the vessels in the operational area introduces the potential for interaction with marine fauna present at the same location during the activity. Marine fauna in surface waters that could be most at risk from vessel collision or entanglement include marine mammals, marine turtles and whale sharks. As summarised in Table 3-9, the operational area overlaps BIAs for whale shark (foraging), humpback migration, and pygmy blue whale (distribution).

Vessel strike and vessel disturbance are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advices (Table 3-10). Incidents with marine fauna are recorded and reported by Santos as described in Table 8-4.

Pelagic fishes may also be attracted to the Reindeer facilities either through the physical presence (shelter), alteration of currents, artificial lighting (Section 6.2) or increased prey abundance.

Marine mammals and sharks/rays

The Approved Conservation Advice for *Rhincodon typus* (whale shark) (TSSC, 2015a) recognises vessel strike as one of the threats to the recovery of whale sharks. Whale sharks aggregate at the Ningaloo coast between March and June each year. Whale sharks are at risk from vessel strikes when feeding at the surface or in shallow waters (where options to dive are limited). Given the operational area overlaps with the whale shark foraging BIA (Table 3-8), individuals may be encountered during the activity. However, large numbers of whale shark encounters are not expected, given that the BIA is ~80 km wide at this location, extending predominantly through deeper waters and with the nearest whale shark aggregation site ~280 km from the operational area.

No constraints within the operational area (e.g. shallow water or shorelines) would prevent whale sharks from moving away from vessels.

A number of whale species may also transit through the operational area, including humpback whales and pygmy blue whales given the operational area overlaps with BIAs. Sei and fin whales may also encounter foraging or feeding habitat through the operational area, although it is unlikely that there will be significant numbers of these species encountered during the activity. However, given the water depths in the operational area, it is unlikely there will be significant numbers of these species encountered during the activity.

The most commonly sighted whale in continental shelf waters of the region is the humpback whale. Vessel activity may occur during the humpback migration period, creating the potential for humpback whales to be encountered in the operational area. Humpback whales are one of the most frequently reported whale species involved in vessel strikes worldwide (Laist *et al*., 2001; Jensen & Silber, 2003). This observation is supported by Australian studies referenced in the National Strategy for Mitigating Vessel Strike of Marine Mega-fauna (CoA, 2017).

Collision/vessel strike is also identified as a threat to the Southern Right Whale in the National Recovery Plan for the Southern Right Whale. However, the BIA for the Southern Right whale is approximately 240 km from the operational area so the risk of vessel collision with the Southern Right Whale is low.

The worst potential impact from vessel collision or entanglement would be mortality or serious injury of an individual. Collisions between vessels and cetaceans are most frequent on continental shelf areas where high vessel traffic and cetacean habitat occur simultaneously (WDCS, 2006). Instances of cetacean deaths as a result of vessel collisions in Australian waters have been recorded (e.g. a Bryde's whale in Bass Strait in 1992) (WDCS, 2006), although the data indicates this is likely to be associated with container ships and fast ferries. The Whale and Dolphin Conservation Society also indicates that some cetacean species, such as humpback whales, can detect and change course to avoid a vessel (WDCS, 2006). The reaction of whales to the approach of a ship is quite variable. Some species remain motionless when in the vicinity of a ship while others are known to be curious and often approach ships that have stopped or are slow-moving, although they generally do not approach and sometimes avoid faster-moving ships (Richardson et al., 1995).

Vessel speed has been demonstrated to be a key factor in relation to collision with marine fauna, particularly cetaceans, with faster-moving vessels posing a greater collision risk than slower vessels (Laist et al., 2001; Jensen & Silber, 2003; Hazel, 2009). Laist et al. (2001) suggest the most severe and lethal injuries to cetaceans are caused by vessels travelling at 14 knots or faster.

Whale sharks are likely to exhibit a short-term avoidance to vessels, divers or ROVs. This is likely to be initiated through the vibrations and underwater noise emitted from these activities (Section 6.1) rather than the physical presence. Such avoidance is likely to be temporary.

The operation of vessels, ROVs, and divers is highly unlikely to impact on the migration routes of whales (in particular the humpback whale, which passes close to Barrow and Montebello islands between June and September (Table 3-12). Although some level of disturbance may occur, this is likely to be primarily caused by underwater noise from vessels and ROVs within the operational area (Section 6.1), rather than their physical presence.

Dugong are known to occur in and around seagrass growth areas and to exhibit some stereotypical inquisitive behaviours (Anderson, 1982). Though they are migratory, some species habitat is likely to occur within the region. The risk of dugong strike can be lowered significantly by minimising movements directly over seagrass beds in shallow waters. Vessels will be operating in depths of ~38 to 59 m. Seagrasses have not been identified as present within the operational area, given the water depths and insufficient light availability.

Species may be temporarily attracted to the WHP, especially around the time when aggregations occur adjacent to the Ningaloo coastline between March and May.

Marine reptiles

Turtle/vessel interactions arising from increased vessel traffic is recognised as one of a number of key threats to marine turtles in the Recovery Plan for Marine Turtles (Commonwealth of Australia, 2017).

Marine turtles make extensive migrations through the region; and it is possible that individual turtles of any of the species known from the region may be encountered in the operational area, particularly given the proximity to the designated flatback turtle internesting buffer BIA associated with the Montebello Islands and Barrow Island nesting locations. However, given the distance of the operational area to nesting beaches (nearly 60 km and 90 km to the Montebello Islands and Barrow Island respectively) and the absence of important foraging habitat for any species in the operational area, large numbers of turtle encounters are not expected.

Marine turtle mortality due to vessel strike has been identified as an issue in Queensland waters in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017). However, turtles appear to be more vulnerable to vessel strike in areas of high urban population where incidents of pleasure crafts are higher. Given the relatively low human population density of the NWS coastline, WA turtle populations are not considered to be the most affected Australian turtle populations by vessel strike.

Turtles will typically avoid vessels by rapidly diving. However, their ability to respond varies greatly depending on the speed of the vessel. Hazel (2009) reported that the number of turtles that fled vessels decreased significantly as vessel speed increased. Turtles are also adapted to detect sound in water (Popper et al., 2014) and will generally move from anthropogenic noise-generating sources, including vessels, within their detection range.

Sea snakes are known to intermittently occur within the operational area. During use of ROVs for inspections in close proximity to subsea infrastructure, sea snakes are at risk of strike by the ROV thrusters or entanglement. Impacts could range from injury to the individual to mortality.

Birds

A number of protected species of marine birds have potential habitats or migratory routes in and around the operational area (Table 3-8). And BIAs for breeding overlap the operational area for the Roseate tern and wedge-tailed shearwater. The presence of the WHP provides a structure for birds to rest, with subsequent short-term positive effects. Seabirds may be attracted to the WHP due to increased feeding opportunities on pelagic fish. However, these behavioural changes are unlikely to alter population dynamics or significantly change the habitat use of birds. Although the presence of bird deterrents will result in the birds being deterred from landing on the infrastructure (refer Section 6.1).

The number of helicopter flights required to the WHP is relatively low; and flights occur in the daylight, thereby reducing potential interactions with birds.

Helicopter noise is expected to elicit a behavioural response in birds to avoid collision; and given the relatively low speeds helicopters would be flying at during take-off or landing, the risk of helicopter strike is not high.

During landing and take-off, large slow birds are at risk of strike from helicopter rotors. Ornithological technological specialists have not identified any EPBC Act–listed protected species within the operational area as at very high or extreme risk of strike. The incident of bird strike is a significant safety concern for helicopters and is classified as a major accident event in the Reindeer WHP Safety Case RE-02-RF-00029). Santos is committed to ensuring the safety of aircraft and passengers visiting the normally unmanned Reindeer WHP. The Santos Bird Management Plan (EA-00-RI-10191) has been developed with technical advice from ornithological and technological specialists to ensure the safety of helicopter transfers and minimal impact to birds.

An additional hazard caused by birds is the build-up of guano on the platform, leading to:

- Helideck markings and lights becoming obscured
- Safety-critical equipment on the platform becoming obscured and possibly deteriorating at a quicker rate
- Health and hygiene issues for personnel on the WHP
- Surfaces becoming slippery, particularly after rainfall.

To minimise the risk of bird strike and serious safety events, bird deterrent devices are in use. This will ensure birds safely vacate the platform prior to helicopter landing and take-off. Guano is periodically cleaned from the platform using seawater.

Demersal and pelagic fish

Demersal fish (Section 2.11) that associate with reef and hard substrate areas are likely to be attracted to the artificial habitat created by the subsea infrastructure, although, on a population level, this attraction is unlikely to be significant in terms of redistributing the abundance of fishes. This artificial habitat may increase the local survival and recruitment of some demersal fishes, although again this is unlikely to be significant on a population or ecosystem level given the small area of infrastructure and the existence of natural hard substrate and reef habitats nearby (particularly adjacent to the Montebello, Barrow and Lowendal islands).

Pelagic and demersal fish are likely to exhibit a short-term avoidance to vessels, divers or ROVs. This is likely to be initiated through the vibrations and underwater noise emitted from these activities (Section 6.1) rather than the physical presence. Such avoidance is likely to be temporary.

7.2.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- No injury or mortality to EPBC Act and WA Biodiversity Conservation Act 2016 listed marine fauna during activities [EPO-RE-01].

The control measures considered for this activity are shown in Table 7-3, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-3: Control measures evaluation for marine fauna interaction

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-18	Constant bridge watch	Administrative	Monitoring of surrounding marine environment to identify potential collision risks (and reducing harm) to cetaceans and other marine fauna.	No additional cost; industry practice and regulated by AMSA.	Adopted – Industry practice; benefits outweigh cost.
RE-CM-01	Procedure for interacting with marine fauna.	Administrative	Reduces risk of physical and behavioural impacts to EPBC Act-listed marine fauna from interactions with	Potential delay in vessel movement, increasing activity duration and costs to Santos. Personnel costs involved in reporting sightings to authorities.	Adopted – Benefits of reducing risk of impacts to marine fauna outweigh the costs. Implementing relevant EPBC Act procedures for

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			support vessels and helicopters.		interacting with EPBC Act listed marine fauna complies with the EPBC Regulations 2000.
Additional Control Measures					
N/A	Adopt further measures to those outlined in 'EPBC Regulations 2000 — Part 8 Division 8.1' during peak periods of ecological sensitivity, e.g. additional management considerations for vessels outlined in the Australian National Guidelines for Whale and Dolphin Watching (2017).	Administrative	Potentially provide an additional level of protection of marine fauna.	Administrative costs to update existing procedure. Operational costs through interruption to activities through implementation of controls developed for an industry trying to get close to marine fauna, when Santos activities aim to avoid fauna.	Rejected – The existing control “procedure for interacting with marine fauna” has been written in accordance with the EPBC Act and other relevant guidelines. A review of this procedure against the Australian National Guidelines for Whale and Dolphin watching found that there are no additional relevant controls in the Australian National Guidelines for Whale and Dolphin watching and therefore adopting this control is not ALARP.
N/A	Restrict the timing of activities to operate only outside of sensitive periods.	Isolation	Reduce risk of collisions (causing harm) during environmentally sensitive periods for listed marine fauna.	Protected marine fauna species are present year-round, meaning there are no non-sensitive periods to operate in.	Rejected – Grossly disproportionate to the environmental benefit and would severely limit operations, which are required to occur 24 hours a day, seven days a week.
N/A	Dedicated Marine Fauna Observer on support vessels.	Administrative	Improves ability to spot and identify marine fauna at risk of collision (that may cause harm).	Additional cost of contracting several specialist Marine Fauna Observers.	Rejected – Grossly disproportionate to the environmental benefit and would severely limit operations, which are required to occur 24 hours a day, seven days a week.
N/A	Activities will only occur during daylight hours.	Elimination	Potential for a vessel-fauna collision occurring is decreased due to vessel being stationary when visibility is lower at night.	Lengthens time of the activity as operations only continue for approximately ten hours/day or less in winter. Increased cost due to increased operation time (more than double the cost	Rejected – Substantial additional cost due to doubling of activity duration. No overall environmental benefit as results in increased impacts and risks.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
				and therefore grossly disproportionate).	

7.2.4 Environmental impact assessment

Description – Marine Fauna Interaction	
Receptors	Threatened, migratory, or local fauna
Consequence	II – Minor
In the event of a collision with fauna, there is the potential for injury or death of an individual. The number of receptors present in the operational area during the intermittent transport or maintenance activities is expected to be limited to a small number of transient individuals. The likelihood of lethal collision depends on the number of animals in the vicinity of vessel operations, the probability of a fauna collision and the severity of damage caused by that collision. Given that the support vessels will move slowly (<5 knots) within the operational area and that the activity is of short duration, the risk of fauna collision is extremely low. Consequences will be limited to, at worst, injury or mortality of individuals of any species. Boat strike and vessel disturbance are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice. The above information demonstrates that, with control measures in place, the activity will be conducted in a manner that reduces potential impacts to ALARP and an acceptable level. There is the potential for death or injury of EPBC -Act listed individual species; however, as they would represent an individual within the local population, it is not expected that it would result in a decreased population size over what would usually occur due to natural variation, at a local or regional scale, it is expected that the loss of an individual would be a II – Minor consequence. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country	
Likelihood	C – Possible
Vessels will be moving very slowly while inside the operational area, posing a low risk of collision with marine fauna. In addition, the noise generated from vessel operations may locally deter marine fauna from coming in close proximity to vessels. No known aggregation areas (breeding, resting or calving) occur within the operational area; therefore, concentrations of milling individuals are unlikely. However, as the operational area overlaps whale migration pathways; thus, migrating individuals may traverse the operational area. With controls in place ensuring the vessels are compliant with EPBC Regulations, the likelihood of a collision or entanglement with marine fauna resulting in a low consequence is considered to be C – Possible.	
Residual Risk	Low

7.2.5 Demonstration of ALARP

The Reindeer WHP and DC supply pipeline are fixed structures that have been in place since 2011. The continued presence of this infrastructure is highly unlikely to impact on marine fauna or cetacean migration as the infrastructure is fixed in place and does not prevent or obstruct the movement of marine fauna in the area.

Any impact caused by the physical presence of the WHP and DC supply pipeline is likely to be localised and temporary, with marine species expected to resume normal behavioural patterns in the open oceanic waters surrounding the operational area in a short time frame.

The use of support vessels in the field is necessary for the safe and efficient operation of the production facilities. Without vessels providing support for activities via replenishment of materials and subsea inspections, the risk of equipment failure leading to a safety or environmental incident is increased. Therefore, elimination of subsea equipment inspection activities or supply transfer to eliminate the risk of marine fauna collision is not considered practicable.

The frequency of materials transfers has been determined to ensure the optimal safe and efficient operation of the platform. A reduction in the frequency of material supply is possible; however, this would require an increased holding capacity of consumables, such as diesel and chemicals, and increase the risk of a larger hydrocarbon or chemical spill. Therefore, reducing this frequency is not practicable. In addition, the frequency of subsea inspections has been determined for the safe operational duration to proactively prevent equipment failure based on Santos' experience on the North West Shelf. Therefore, the frequency of vessels required in the field is considered ALARP, based on the required safe operation and maintenance requirements of the platform and DC supply pipeline.

In the event that vessels come in close proximity to EPBC Act–listed marine fauna, such as whales and whale sharks, environmental performance standards (Table 8-2) have been implemented for limiting vessel operations, as well as for ensuring that the crew are aware through inductions of the risk posed by conducting the activity, in order to reduce the likelihood of a marine fauna collision to ALARP. Inductions for the crew of support vessels will include information on how to interact with cetaceans and whale sharks in accordance with the EPBC Regulations.

The inherent likelihood of encountering fauna in the operational area is limited by the short duration of the activities and the separation from areas of high surface-fauna density. With low vessel speeds and compliance with fauna interaction procedures, including Regulation 8 of the EPBC Regulations 2000, which aim to prevent adverse interactions of vessels with marine megafauna, a fauna collision is considered possible. With the controls adopted, the assessed residual risk for this impact is ALARP.

7.2.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum marine fauna collision residual risk ranked Low.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with Part 8 of the EPBC Regulations. Control measures implemented will minimise the potential risks and impacts from vessel strike from the activity to relevant species identified in recovery plans and conservation advice (Table 3-6). Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10. Relevant species Recovery Plans, Conservation Management Plans and management actions.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Application of the proposed management controls and adherence to Commonwealth regulations reduces the likelihood of interactions with marine fauna. While the potential exists for a collision to occur, it is considered possible it could occur. Vessels will be travelling at low speeds within the operational area, further reducing the likelihood of fauna strike. In the unlikely event that an impact did occur, it would be highly probable that only a single individual would be contacted (resulting in a minor consequence); therefore, the impact is considered to be ALARP and environmentally acceptable.

7.3 Release of solid objects

7.3.1 Description of event

Event	Solid objects such as those listed below can be accidentally released to the marine environment during operations, IMMR and CoP activities: • Non-hazardous solid wastes, e.g. paper, plastics and packaging • Hazardous solid wastes, e.g. batteries, fluorescent tubes, medical wastes, and aerosol cans • Equipment and materials, e.g. hard hats, tools or infrastructure parts, ROV baskets, containers. Release of these solid objects may occur as a result of overfull and/or uncovered bins, incorrectly disposed items or spills during transfers of waste.
Extent	The event will only occur within the operational area, and all non-buoyant waste material or dropped objects are expected to remain within the operational area. Buoyant objects could potentially move beyond the operational area.
Duration	An unplanned release of solids may occur during operational, IMMR and CoP activities.

7.3.2 Nature and scale of impacts

<u>Potential Receptors: Benthic habitats, fish and sharks, marine mammals, marine reptiles and seabirds</u>

Physical environment

Objects accidentally dropped to the seabed could occur during the activity, such as the transfer and lifting of objects and equipment. Equipment and other items lost at sea could be caused by crane failure, adverse weather, human error, rigging failure and vessel motions and potentially could lead to loss of or changes to benthic habitats. The area of potential disturbance from a non-buoyant dropped object would be restricted to the area in which it was dropped. In the unlikely event that seabed equipment being recovered is dropped to the seabed, disturbance to benthic habitat would occur, the area of which will be confined to the footprint of the equipment. Potential for the object to be recovered may take time but would be less than one year).

The seabed within the operational area is a primarily soft sediments with little epifauna. This habitat type is widely distributed and well represented in the North West Shelf region. The potential for benthic habitat damage would be greatest over sensitive seabed features, which, within the operational area, comprise filter-feeding communities, including sponges, gorgonians and other sessile (fixed in one place) invertebrates.

While soft sediment benthic habits will not be destroyed, disturbance of the communities on and within them (i.e. the epifauna and infauna) will occur in the event of a dropped object; and depressions may remain on the seabed for some time after removal of the dropped object as they gradually infill over time. Similarly, the temporary turbidity and sedimentation associated with the ROV activities is not considered likely to cause a significant environmental impact, given the sparseness of benthic cover and the highly localised impact zone. The seafloor of this bioregion is strongly affected by cyclonic storms, long-period swells and large internal tides, which can resuspend sediments within the water column and move sediment across the seafloor. In this context, any potential sediment movement caused by the event is likely to have minimal impacts.

Impacts to benthic communities from dropped object disturbance are expected to be short term in duration due to the ability for such communities to recover. Recovery is expected within six to 12 months, based on previous surveys (URS, 2010).

Small buoyant dropped objects have the potential to be transported by marine currents and may impact on reefs, islands, shoals and banks within the region. Accidentally dropped objects, such as plastics, have the potential to smother benthic environments, and the release of hazardous solids (e.g. wastes such as batteries) could also impact water quality through pollution of the immediate receiving environment. Impacts from accidentally released liquids are discussed in Section 7.4.

Threatened, migratory or local fauna

Solids such as plastics have the potential to affect benthic environments and to harm marine fauna through entanglement or ingestion. Marine turtles and seabirds are particularly at risk from entanglement. Once ingested, plastics can damage internal tissues and inhibit physiological processes, which can both potentially result in fatality (Derraik, 2002). Marine turtles may mistake plastics for food; once ingested, plastics can damage internal tissues and inhibit physiological processes, which can both potentially result in fauna fatality. Floating, non-biodegradable marine debris has been highlighted as a threat to marine turtles, whales, whale sharks, and albatrosses and giant petrels in the relevant recovery plans and approved conservation advice (refer to Table 3-10). The recovery plans and approved conservation advice, as well as the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018), have specified a number of recovery actions to help combat this threat. Of relevance to this event is the legislation for the prevention of garbage disposal from vessels. As the WHP is an unmanned platform and vessel activity is infrequent, the risk from small plastics is diminished.

Release of hazardous solids (e.g. wastes such as batteries) may result in the pollution of the immediate receiving environment, leading to detrimental health impacts to marine flora and fauna. Physiological damage can occur through ingestion; or absorption may occur in individual fish and sharks, marine mammals, marine reptiles or seabirds.

AUVs utilise acoustic doppler measurements to detect and prevent seafloor contact; and in the event of low power, they are designed to float to the surface and transmit their position for recovery reducing the potential for impact with the seabed.

Socio-economic receptors

Tourism activities, such as snorkelling, diving, surfing and recreational fishing are not expected to occur in the operational area, given the water depth, lack of seafloor features and distance from shore. Although dropped solid objects have potential to float to nearby areas used for tourism or recreational purposes solid non-hydrocarbon releases are not expected to occur frequently or to a scale that may cause significant pollution that would impact the socio-economic values of these areas. Impacts to socioeconomic receptors could occur should debris interfere with other marine users or their equipment (for example, fishing nets).

7.3.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [EPO-RE-07]

The control measures considered for this activity are shown in Table 7-4, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-4: Control measures evaluation for release of solid objects

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-02	Vessels planned maintenance system (PMS) to maintain vessel DP, engines, and machinery	Administrative	Requires that lifting equipment is maintained and certified, and that lifting procedures are followed, reducing probability of dropped objects occurring.	Additional personnel costs of ensuring equipment is maintained and certified as appropriate and that procedures are in place and followed.	Adopted – Benefits of ensuring procedures are followed and equipment is compliant outweigh the minimal costs of personnel time.
RE-CM-07	Facilities Planned Maintenance System.	Administrative	Requires that lifting equipment is maintained and certified and that lifting procedures are followed, reducing probability of dropped objects occurring.	Additional personnel costs of ensuring equipment is maintained and certified as appropriate and that procedures are in place and followed.	Adopted – Benefits of ensuring procedures are followed and equipment is compliant outweigh the minimal costs of personnel time.
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of dropped objects because lifting equipment is operating within its parameters.	Operational costs and labour or access requirements of undertaking equipment maintenance on vessels.	Adopted – Benefits of operating equipment within operational parameters will help reduce the likelihood of dropped objects.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
RE-CM-28	Waste (Garbage) Management Procedure	Administrative	Reduces probability of garbage being discharged to sea, reducing potential impacts to marine fauna. Stipulates putrescible waste disposal conditions and limitations. Marine Order 95 (Marine pollution prevention – garbage).	Personnel cost of premobilisation audits and inspections and in reporting discharge levels.	Adopted – Benefits of ensuring vessels are compliant outweighs the minimal costs of personnel time and it is a legislated requirement.
RE-CM-40	Dropped Object Prevention Procedures.	Administrative	Impacts to environment are reduced by preventing dropped objects. Requires dropped objects to be recovered (where safe and practicable to do so unless the environmental consequences are negligible).	Personnel costs involved in implementing procedures and in incident reporting.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time.
Additional Control Measures					
N/A	Eliminate lifting in field.	Eliminate	Reduces the risk of releasing non-hydrocarbon solid to the marine environment due to dropped object.	Eliminating lifting would require support vessels storing more equipment and supplies on board, and/or additional trips to shore. Support vessels will not have enough deck space to store all required equipment, materials, and supplies needed for the duration of the activity, without incurring safety risks.	Rejected – Not feasible to eliminate lifting in the field.
N/A	Eliminate transfers during night-time activities.	Substitute	Reduces risk of not seeing any dropped objects during transfers.	Reducing the window for lifting would potentially limit the activity considerably due to the tide restrictions in the area.	Rejected – Not feasible to eliminate lifting in the field over 24 hours.

7.3.4 Environmental impact assessment

Description – Release of Solid Objects (Large items such as equipment lost during transfers)	
Receptors	Physical environment or habitats (benthic).
Consequence	I – Negligible – for smaller windblown waste i.e. hard hats that would float
	II – Minor – for larger items that would sink
Physical environment – Seabed disturbance Non-buoyant dropped objects are expected to impact the seabed and be limited to the size of the dropped object, and given the size of standard materials transferred, any impact is expected to be very small and limited to within the operational area in which it was dropped. In the unlikely event that seabed equipment being recovered is dropped to the seabed, disturbance to benthic habitat would occur, the area of which will be confined to the footprint of the dropped equipment. Any area of the seabed impacted through dropped objects would be expected to recover. Previous surveys indicate the seabed is likely to comprise soft sediments with little epifauna (Section 2.11). Consequently, any impacts are predicted to be short term in nature. Buoyant dropped objects have the potential to smother benthic habitats of they eventually sink and could wash up on island beaches. It is considered that the application of management measures will effectively prevent this impact occurring on a significant scale. Therefore, impacts will result in a Negligible (I) reduction in habitat area or function.	
Marine fauna – Cetaceans, marine turtles, seabirds, fish and sharks In the event of loss of a solid object, the quantities would be limited by the Reindeer activities defined in Section 2. The release could cause localised impacts to water quality and the benthic environment. If the solid object can be ingested by marine fauna, impacts would be restricted to a small number of individuals, if any. Ingestion of waste materials by marine fauna could occur in small quantities. Only small volumes of waste (e.g. plastic packaging) would be generated during the activity. Impacts from ingestion or entanglement may occur to a small number of individuals, if any. No consequences for conservation status or reproductive success of cetaceans, marine turtles or fish species that may occur in the area are expected. Any impacts would be restricted to a small number of individuals, if any. Relevant recovery plans and conservation advice have identified marine debris as a potential threat. There is a Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018). As such there is the potential for impacts only to a small proportion of a local population with no consequences for conservation status or reproductive success of cetaceans, marine turtles or fish species that may occur in the area. The limited quantities associated with this unplanned event indicate that even in a worst-case release of solid waste, the number of fauna fatalities would be limited to individuals and is not expected to result in a decrease of the local population size. Therefore, the consequence is Minor (II) for large objects and negligible for smaller objects.	
Socio-economic receptors (tourism and recreation) In the event of a release of a buoyant object that cannot be recovered, it could present an obstacle to other marine users. Eventually the buoyant object may become non-buoyant and sink to the seabed where it may degrade over time. The time taken for this is dependent on the material released and any impacts to marine fauna and the seabed are described above. This may present a risk to commercial trawling activities and damage their equipment, so fishers may be required to avoid a highly localised area to avoid interaction. Given the likely size of buoyant equipment (i.e. storage drum), it will drift with the currents. It is considered unlikely to present a significant hazard to other marine users and the consequence level is therefore II- Minor. Impacts to tourism and recreation have the potential to occur through buoyant objects floating into areas used for these activities, adversely impacting tourism and recreation values and creating poor aesthetics. Given the limited quantities associated with this unplanned event, even a worst-case release of solid waste is unlikely to have flow-on effects significant enough to impact the tourism and recreation industries. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. Therefore, the consequence is Negligible (I).	
Likelihood	C-Possible for smaller items such as hard hats that would float
Likelihood	B – Unlikely- for larger items that would sink
Control measures proposed ensure that the risk of solid objects to the environment has been minimised. The likelihood of transient marine fauna occurring in the operational area coincident with a release is B – Unlikely; and given the control measures in place and the infrequency of personnel and vessels in the operational area, the likelihood of a loss of solid objects resulting in a consequence greater than II –(Minor) is considered B – Unlikely (assumes potential for a single loss of solid waste event during the activity). For smaller objects the likelihood of transient marine fauna occurring in the operational area coincident with a release is limited; and given the control measures in place, the likelihood of releasing solid objects to the environment resulting in a greater than I -Negligible consequence is considered C – Possible (assumes potential for some losses of small items such as plastic packaging, hard hats, water bottles).	
Residual Risk	Very Low

7.3.5 Demonstration of ALARP

Solid objects will unavoidably be handled during the activity. The control measures proposed reduce the residual risk of their release to Very Low, and this cannot be reduced further with any reasonably practicable additional control measures. The potential unplanned impacts in this scenario are considered to be ALARP.

Transfer of objects to the WHP is required for the activity to accomplish maintenance, repair and general operations of the Reindeer facilities; these transfers are managed through transfer procedures and equipment management. Without ongoing maintenance, occasional repairs and upgrade of equipment, the risk of failure leading to a safety or environmental incident is increased. The Reindeer facilities need to be restocked with essential operating materials. Therefore, eliminating supply transfer to eliminate the risk of a dropped objects is not considered practicable.

The frequency of materials transfers has been scheduled to ensure the optimal safe and efficient operation of the platform. A reduction in the frequency of material supply would not reduce the number of lifts (thereby reducing the risk of dropping an object) as the same volume of supplies would still be required. In addition, the frequency of subsea inspections has been scheduled to achieve the safe operational duration to proactively prevent equipment failure based on Santos' experience on the North West Shelf. Decreasing the frequency of supply and maintenance activities will require larger supply transfers and increases in the duration and complexity of maintenance activities. This frequency of material supplies and subsea inspections is considered ALARP, based on the safe operation and maintenance requirements of the platform and DC supply pipeline.

If an object is dropped, the incident will be responded to in accordance with the implementation strategy for incident response (Section 8.9). With the above controls in place, Santos considers the residual risk arising from a dropped object is ALARP.

7.3.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum seabed disturbance residual risk ranked Very Low.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with MARPOL Annex III. Control measures implemented will minimise the potential impacts from the activity to species identified in recovery plans and approved conservation advice as well as the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018) as having the potential to be impacted by non-hydrocarbon surface releases of solid objects. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10. Specific actions that contribute to the long-term prevention of marine debris (Objective 1 of the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE 2018)) have been adopted, including compliance with applicable legislation in relation to the improvement of waste management practices
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

Potential environmental impacts from a dropped object would most likely be extremely minor and related to indents in the soft sediment habitat assumed to be within the operational area. Given the sediment habitat is expected to recover relatively rapidly (within six to 12 months), the potential impacts are considered environmentally acceptable. Through implementation of the proposed management controls, the risk of dropping an object is reduced to a level that is considered acceptable.

With the controls in place, which align with relevant actions prescribed in the Threat Abatement Plan for the Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE, 2018) to prevent accidental release of solid objects, and the negligible (I) impact predicted from entanglement or ingestion with solid waste material by marine fauna and the minor (II) impact associated with a larger dropped object sinking to the seabed, the low risk of a solid object release to the environment is considered to be ALARP environmentally acceptable.

7.4 Hazardous liquid releases

7.4.1 Description of event

Event	Causes for accidental liquid releases (other than diesel, LOWC or DC supply pipeline rupture which are covered in sections 7.6, 7.7 and 7.8) during operations, IMMR and CoP activities include: • Hydraulic fluids, lubricant oils and stored waste oils from: – ROV failure (including oil seal, hydraulic system hose and quick-disconnect system failures) – Loss of primary containment (drums, tanks, intermediate bulk containers, etc.) due to handling, storage and dropped objects (e.g. swinging load during lifting activities) – Vessel or WHP pipework failure or rupture, hydraulic hose failure and inadequate bunding. • Chemicals, including corrosion inhibitor, cleaning and cooling agents, recovered solvents, stored or spent chemicals, leftover paint materials and used greases, through: – Bunkering from storage tanks to bulk tanks or transferring to day tanks or due to component failure, such as flexible hoses – Spills or leaking machinery accidentally discharged overboard in deck drainage water – Overflow of the open and closed drainage systems – Tank or pipework corrosion or rupture on the Reindeer WHP – Loss of primary containment (drums, tanks, intermediate bulk containers, etc.) due to handling, storage and dropped objects (e.g. swinging load during lifting activities). The WHP and supply vessel main engines and equipment, such as pumps, cranes, winches, power packs and generators, require diesel for fuel and a variety of hydraulic fluids and lubricating oils for efficient operation and maintenance of moving parts. These products are present within the equipment and also held in storage containers and tanks on the WHP (~200 L) and supply vessels. Small hydrocarbon leaks could occur from loss of primary containment due to handling, storage and dropped objects (during lifting activities). Volumes are likely to be small and limited to the volume of individual containers (e.g. intermediate bulk containers, 44-gallon drums) stored on the deck of supply vessels or the WHP. The credible spill for this scenario is considered to be the loss of an intermediate bulk container (1 m^3) during transfer from a vessel to the WHP. ROV operations can result in unplanned discharges (of hydraulic fluids) directly to the marine environment due to equipment failure, ROV interactions with the vessel thrusters or accidental contact with subsea infrastructure. The largest credible hydrocarbon spill from ROV operations would be an accidental release of ~0.05 m^3 (50 L) of hydraulic fluid from the deployed ROV. Minor accidental loss of other hydrocarbon-based liquids (e.g. used lubricating oils, cooking oil, and hydraulic oil) to the marine environment could also occur via tank or pipework failure or rupture, hydraulic hose failure, inadequate bunding or storage, insufficient fastening or inadequate handling, which could result in impacts to water quality and hence sensitive environmental receptors. Oily water from the open drain system on the WHP is stored in an atmospheric sump, while hydrocarbons collected from the closed drainage system (liquid separated in the fuel gas system, drainage from the production header during maintenance and pig launcher drainage) is collected in a closed drain sump. The hydrocarbons collected in both the atmospheric and closed sump are pumped into the production stream by automatic sump pumps. In the event that the sump pump fails, the oily water could be discharged overboard. Oily water from vessels includes bilge water and deck drainage water. In the event that the oil discharge monitoring equipment fails, water containing hydrocarbons at more than 15 ppm could be accidentally discharged overboard. Release of chemicals to the sea could occur via tank or pipework corrosion or rupture on the Reindeer WHP. The chemical injection system located on the main deck is required to control corrosion in the DC supply pipeline. The chemical injection system includes three corrosion inhibitor injection tanks (two 1,600 L and one 3,800 L capacity tanks). The corrosion inhibitor is a continuously used chemical that is injected at the wellheads. Other chemicals (e.g. biocide) may be used as required for such operations as pigging or biocide runs. Release could also occur from transport of chemicals between support vessels and the Reindeer WHP (i.e. dropped objects or a leak or spill from a transfer hose).
Extent	The relative low volumes are expected to rapidly disperse into the marine environment. Concentrations below toxic or harmful thresholds are expected to occur at short distances from the release point. Should a spill occur, potential impacts beyond the operational area are not expected in the event of a worst-case spill.
Duration	Potentially toxic or harmful threshold concentrations limited to a very short period immediately following release during operational, IMMR and CoP activities.

7.4.2 Nature and scale of impacts

Potential receptors: Physical environment (water and sediment quality, benthic habitats), threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, fish and birds) and socio-economic receptors (commercial fishing, tourism and recreation).

Physical environment

Non-hydrocarbon liquids or chemicals released to the marine environment may lead to contamination of the water column in the vicinity of the release location. The potential impacts would most likely be highly localised and restricted to the immediate area surrounding the spill, with rapid dispersal to concentrations below impact thresholds likely to occur in the open ocean.

Hydraulic fluids and lubricating fluids behave similarly to marine diesel when spilt in the marine environment. Hydraulic fluids are oils of light to moderate viscosity and have a relatively rapid spreading rate. Like diesel, they will dissipate quickly, particularly in high sea states, although lubricating oils are more viscous and so the spreading rate of a spill of these oils would be slightly slower.

Impacts associated with the unplanned discharge of hazardous liquids to the marine environment depend on the nature of the liquid released, the volume and its behaviour in the marine environment (i.e. whether it sinks, floats, disperses, etc.). In the event of a spill to the marine environment, these liquids would be subjected to rapid dispersion and dilution by the open ocean water conditions and prevailing currents.

Potential impacts include a temporary and highly localised decline in water quality. This would have limited potential for toxicity to marine fauna, due to the likely short duration of exposure and rapid dilution of the released hazardous liquids in the marine environment. Impacts are likely to be limited to the immediate vicinity of the spill and would not affect population viability of contacted species or ecosystem function. For small hydrocarbon-based releases, the environmental impacts are expected to be minimal but may include a visual sheen and a slight oiling of wildlife within the first few hours following the spill if conditions are calm.

Due to the small volumes and expected rapid dispersal to concentrations below impact thresholds, impacts to water quality are not expected to cause flow-on effects to sediment quality or benthic habitats, including reefs, and offshore islands. There is no emergent or intertidal habitat that could be impacted by a surface spill. Owing to the water depth and location offshore, any spilled material is unlikely to reach land or affect any of benthic habitats.

Threatened or migratory species

Changes to water quality could potentially lead to short-term impacts on marine fauna (e.g. pelagic fish and sharks, marine mammals, marine reptiles and seabirds). As summarised in Table 3-9, the operational area overlaps with BIAs for whale shark (foraging) humpback and pygmy blue whale (distribution).

Recovery plans and conservation advices for numerous bird species identify marine pollution and contamination impacts as a threat to the species. In addition, the Recovery Plan for Marine Turtles in Australia 2017 to 2027 (Commonwealth of Australia, 2017) identifies deteriorating water quality as a threat to all species of marine turtles in Australia. These species have been identified as potentially transiting through the operational area from time to time due to overlap with BIAs and critical habitat.

Chemical spills are unlikely to have widespread ecological effects on threatened or migratory fauna, given the nature of the chemicals on board, the small volumes that could be released, and the open-ocean environment of the location. Physical coating of marine fauna, in particular those present at the sea surface (e.g. seabirds), by entrained or surface hazardous liquids and sublethal or lethal effects from toxic chemicals are considered unlikely, given the expected low concentrations and short exposure times.

Socio-economic receptors

Given the localised and temporary impacts of an unplanned hazardous liquid spill, any impact to commercial fishing, tourism and recreation activities is considered unlikely

7.4.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [EPO-RE-07].

The control measures considered for this activity are shown in Table 7-5, with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-5: Control Measures Evaluation for Hazardous Liquid Releases

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-25	Marine Assurance Standard	Administrative	Vessels selected and on-boarded in accordance with the Offshore Marine Assurance Procedure (SO-91-ZH-10001) to ensure contracted vessels are operated, maintained and manned in accordance with industry standards (for example, Marine Orders) and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP.	No additional cost.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-27	Offshore platform deck drain system and bunding.	Engineering	Reduces the likelihood of any oily or chemical content reaching the marine environment from the offshore platform.	Personnel and operational costs associated with construction and maintenance of offshore platform bunding and maintenance of bunding procedure.	Adopted – Benefits of the system in reducing impacts to the marine environment outweigh the personnel and operational costs.
RE-CM-29	Deck cleaning and product selection.	Substitute	Improves water quality discharge (reduced toxicity) to the marine environment. Those deck cleaning products planned to be released to sea meet the criteria for not being harmful to the marine environment according to Australian Marine Orders.	Personnel costs of implementing, potential additional cost and delays of chemical substitution.	Adopted – Benefits of ensuring support vessels are compliant and those deck cleaning products planned to be released to sea meet Australian Marine Orders criteria.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
RE-CM-30	General chemical management procedures.	Administrative	Potential impacts to the environment are reduced through following correct procedures for the safe handling and storage of chemicals.	Personnel costs associated with ensuring procedures are in place and implemented during handling and storage of chemicals.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweigh the costs.
RE-CM-31	Maritime Dangerous Goods Code	Administrative	Reduces potential for inappropriate discharge of dangerous goods at sea through appropriate handling.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-32	Chemical selection procedure.	Administrative	Reduced toxicity to marine environment. Only environmentally acceptable chemicals would be released in the event of an accidental discharge to sea.	Cost associated with implementation of procedure. Range of chemicals reduced but potentially higher costs. Potential additional cost and delays of chemical substitution.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweighs costs.
RE-CM-33	Scupper plugs will be available for deployment in the event of a spill to prevent deck drainage.	Isolation	Reduces potential impacts of contaminants being discharged to sea.	Increased health and safety risks from wet deck not draining. Large amounts of water on a vessel's deck can also cause stability issues (free-surface effect)	Adopted – Benefits of preventing dreck drainage outweighs safety risk.
RE-CM-35	Vessel spill response plan (SOPEP/SMPEP).	Administrative	Implements response plans on board vessels to deal with unplanned hydrocarbon releases and spills quickly and efficiently in order to reduce impacts to the marine environment.	Administrative costs of preparing documents. Plan generally undertaken by vessel contractor so time for Santos personnel to confirm and check SOPEP/SMPEP is in place.	Adopted – Benefits considered to outweigh costs.
RE-CM-41	Inspection of platform structures and hydrocarbon-containing equipment.	Administrative	Reduces likelihood of leaks from equipment on offshore platforms reaching the marine environment.	Personnel and operational costs associated with visiting the offshore platform for an inspection and to check on equipment.	Adopted – Benefits of the inspection to determine operational integrity outweigh the cost to undertake the inspection.
RE-CM-42	Hazardous chemical management procedures.	Administrative	Reduces the risk of spills and leaks (discharges) to sea	Personnel cost associated with implementation of	Adopted – Benefits of ensuring

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			by controlling the storage, handling and clean-up.	procedures and permanent or temporary storage areas.	procedures are followed and measures implemented outweigh costs.
RE-CM-43	Santos Refuelling and chemical transfer standard (SO 91 IO00098).	Administrative	Minimises risk of pollution to ALARP during chemical transfers from an offshore support vessel to an offshore facility.	Personnel costs associated with ensuring procedures are in place and implemented during refuelling and chemical transfers.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweigh the costs.
RE-CM-44	Spill response equipment on producing offshore platforms.	Protective	Provides a means to prevent any deck spills of hazardous liquids reaching the sea.	Costs associated with stocking spill response equipment on vessels and offshore platforms, training personnel and maintaining equipment.	Adopted – Benefits of stocking, using and maintaining spill response equipment outweighs the costs of personnel time and costs of maintenance and training.
RE-CM-45	Remotely operated vehicle inspection and maintenance procedures.	Administrative	Maintenance and pre-deployment inspection on ROV completed as scheduled to reduce the risk of hydraulic fluid releases to the marine environment.	Additional personnel costs of ensuring procedures in place and followed.	Adopted – Benefits of ensuring procedures are followed outweigh costs.

7.4.4 Environmental impact assessment

Description – Hazardous Liquid Releases	
Receptors	Threatened, migratory, or local fauna. Physical environment or habitats
Consequence	I – Negligible

In the event of a minor hydrocarbon or chemical spill, the quantities would be very small (worst case identified to be limited to ~1 m^3 for the loss of the contents of an intermediate bulk container or 50 L for ROV hydraulic fluid). The small volumes and dilution and dispersion from natural weathering processes such as ocean currents are such that spills will be limited in area and duration. The number of receptors present at the activity location are expected to be limited to a small number of transient individuals.

Habitat degradation, deteriorating water quality and marine pollution are identified as potential threats to a number of marine fauna species, including turtles and some bird and shark species, in relevant recovery plans and conservation advice.

However, the potential releases of hazardous liquids are not expected to significantly impact the receiving environment, given the control measures proposed to prevent releases; therefore, the activity will be conducted in a manner that is considered acceptable.

For marine species that may be exposed to the more toxic aromatic components of spilled hydrocarbons, toxic effects are considered unlikely since these species are mobile and therefore will not be constantly exposed for extended durations that would be required to cause any major toxic effects.

Although humpback and blue whales, and whale sharks may be exposed due to their expected presence (BIA overlaps) in the operational area, this event is not expected to interfere with their migration activity.

Toxic impacts are not expected to the benthic community due to the water depths.

Description – Hazardous Liquid Releases	
Near the sea surface, fish, including whale sharks, are able to detect and avoid contact with surface slicks; and as a result, fish mortalities rarely occur in open waters from surface spills (Kennish, 1997; Scholz et al., 1992). Pelagic fish species are therefore generally not highly susceptible to impacts from chemical spills. Pelagic fish in offshore waters are highly mobile and comprise species such as tunas, sharks and mackerel. Due to their mobility, it is unlikely that pelagic fish would be exposed to toxic components for long periods in this spill scenario. The more toxic components would also rapidly evaporate, and concentrations would significantly diminish with distance from the spill site, limiting the potential area of impact. Deteriorating water quality is identified as a potential threat to turtles in the marine turtle recovery plan and to some bird and shark species (Table 3-10) However, the potential minor hydrocarbon or chemical releases are not expected to significantly impact the receiving environment, given the control measures proposed to prevent releases. Therefore, the activity will be conducted in a manner that is considered acceptable. The highly dispersive waters of the operational area with strong drift current and local scale currents (average and maximum surface current speeds of 0.30 m/s and 2.51 m/s respectively, RPS 2024)), will limit impacts to short-term water quality impacts and possible temporary behavioural effects observed in fish, sharks and seabirds. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. Given that a small hydrocarbon or chemical spill would not result in a decreased population size at a local or regional scale, it is expected that a spill of this nature would result in a I – Negligible consequence.	
Likelihood	B – Unlikely
A small non-hydrocarbon liquid release is unlikely to have widespread ecological effects, given the nature of the chemicals on board, the small volume that could be released, the depth and transient nature of marine fauna in this area, and the prevention and management procedures in place to clean up a spill. Santos reviewed non-hydrocarbon liquid spills and leaks from equipment and machinery in recent history (due to split hoses, small leaks, or handling errors). Most of the spills and leaks reported occurred within bunded areas, were <100 L, did not reach the marine environment and were cleaned up immediately. The likelihood of a small hazardous liquids release occurring is limited, given the set of mitigation and management controls in place for this program. Consequently, the likelihood of releasing hazardous liquids to the environment, which results in a minor consequence, is considered to be B- Unlikely.	
Residual Risk	Very Low

7.4.5 Demonstration of ALARP

Storage and use of hydraulic and lubricating oils or fluids for equipment and machinery, including for ROV operations, are required to undertake the activity, so their removal from the activity is not viable.

The generation of hazardous liquid wastes is unavoidable during some WHP maintenance activities or well intervention or suspension activities. However, less toxic chemicals can be substituted for some hazardous liquids. This is done by having all chemicals go through the Santos Chemical Selection process, in order that low toxicity chemicals are preferentially used over more hazardous types, where practicable.

In addition, administrative controls, such as all vessels being required to have a Garbage Management Plan that describes the on-board controls for preventing unplanned discharges, will minimise the risk of the hazardous liquid being accidentally discharged through mishandling or poor storage.

Other management controls that have been implemented include designated storage and handling areas, use of material safety data sheets, spill clean-up equipment and procedural controls (e.g. employee inductions and lifting and handling training), not only to minimise the risk of an accidental release, but also to reduce the impact in the event that a release does occur.

A thorough set of control measures has been proposed to ensure the risks of minor hazardous liquid spills and leaks occurring and subsequent impacts are minimised. The resulting impacts to marine fauna that could potentially result from a spill of this size would be minor, with impacts restricted to a small number of individuals within a localised area.

The control measures proposed are in line with applicable actions described in relevant recovery plans and conservation advice to reduce the risk of habitat degradation and deteriorating water quality (e.g. from pollution) to a level considered to be ALARP by Santos. The assessed residual risk for this impact is low and cannot be reduced further. It is considered therefore that the impact of the activities conducted is ALARP.

7.4.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum minor hydrocarbon spill residual risk is ranked *Very Low*.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.

Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with International Convention of the Safety of Life at Sea (SOLAS) 1974 and Navigation Act 2012, MARPOL Annex I – Oil. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10. Recovery Plan for Marine Turtles in Australia (2017).
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

With the control measures in place to prevent an accidental release of hazardous liquids and the negligible impacts predicted from unplanned spills, the risk to the marine environment is considered Very Low. Potential risks are unlikely to be greater than those caused by other commercial marine vessels or offshore petroleum activities in deep water.

Hazardous liquids will be managed in accordance with relevant legislation and industry standards and Santos procedures. The small volume negates the need for any further contingencies to be in place that are included for some of the larger spill scenarios associated with the activity.

With the control measures in place to prevent accidental spills and the negligible impacts predicted from a spill of this size, the environmental risk of using and handling the required chemicals is considered acceptable.

7.5 Overview of unplanned release of hydrocarbons

7.5.1 Credible spill scenarios

A number of unplanned events may occur during the operation of the Reindeer facilities, IMMR and CoP activities, resulting in the potential release of hydrocarbons (condensate and diesel) to the marine environment. The spill scenarios assessed in Sections 7.5.6.5 to 7.8.

Spill modelling was undertaken for the scenarios presented in Table 7-6 by RPS during 2024 to support the EP submission (RPS, 2024).

7.5.2 Spill scenario selection

To select the spill scenarios that were considered credible for the Reindeer facilities a broad range of potential scenarios were assessed as described below.

The maximum credible spill scenario at the WHP is a loss of well containment during well intervention activities resulting in a surface release of condensate. Given there is no subsea wellhead, the platform substructure and surface conductor protect the primary and secondary barrier envelopes from direct contact. Preventive barriers also include barrier monitoring and testing as per the well operations management plans (WOMPs) (DR-91-ZG-10045, Rev 1, and DR-91-ZG-10038, Rev 1). Therefore, a subsea loss of well control is not considered credible in the event of a loss of platform integrity.

In the event of a vessel collision with the WHP resulting in significant damage to the platform, the fail-safe closed actuated wing valves on the production trees will shut in, and the subsurface safety valves on each well will fail-safe closed upon loss of control line pressure. Accordingly, a loss of well control at the surface is not considered credible in the event of a vessel collision. The maximum credible spill scenario of a loss of well control at the surface at the WHP from well intervention activities is discussed in Section 7.5.6.5.

It is considered credible that an unplanned release of condensate, during the operations phase or seawater/nitrogen during the preservation phase could occur from the subsea DC supply pipeline. Loss of containment caused by a dropped object, anchor drag, or loss of pipeline integrity is deemed a credible scenario under the assumption of multiple and simultaneous failures of the controls in place. A loss of containment would escalate to a loss that would be detected and result in an almost instantaneous emergency shutdown. The maximum credible scenario was determined as being a complete loss of the volume of condensate in the DC supply pipeline (largest hydrocarbon storage capacity of 121.4 m^3), due to an automatic detection of the leak and the safety valves at the WHP end and the DCGP end of the DC supply pipeline being automatically closed. A subsea release of condensate from the DC supply pipeline in Commonwealth waters is considered in Section 7.7.

It is considered credible that a release of diesel to the marine environment could occur from a support vessel collision with the WHP or with another vessel in the operational area. Such a collision could have sufficient impact to result in rupture of a vessel's diesel tank. This is considered credible given that the diesel tanks may not be protected or double-hulled and that fuel tank ruptures leading to hydrocarbon release have occurred before. The maximum credible spill volume from a vessel incident is 325 m^3 based on the largest single fuel tank capacity. This scenario would result in a spill of diesel at the sea surface.

Another credible spill scenario identified is a release during vessel bunkering (fuel hose failure or rupture, coupling failure, or tank overfilling) where fuel bunkering would need to be stopped manually. Fuel released prior to the cessation of pumping, as well as fuel remaining in the transfer line, may escape to the environment. Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities (AMSA, 2015) provides guidance for calculating a maximum credible spill volume for a refuelling spill. The maximum credible spill volume during refuelling is calculated as transfer rate (60 m^3/hr) × 15 minutes of flow, resulting in a potential 15 m^3 spill volume at the sea surface. The detection time of 15 minutes is seen as conservative but applicable following failure of multiple barriers followed by manual detection and isolation of the fuel supply.

A vessel collision scenario is the maximum credible diesel spill scenario from a vessel fuel tank and has been modelled at the WHP and at the Commonwealth–State waters boundary. A surface release of vessel tank diesel at the Commonwealth–State waters boundary represents the worst-case spill of the two scenarios and is discussed in Section 7.8 below.

The maximum credible spill scenarios presented were based on the below TFNs which were revised for cessation of production activities in 2024:

- Devil Creek Gas Supply Pipeline – Pipeline Rupture TFN (7745-650-REP-0029), January 2024
- Technical File Note: Reindeer Blowout Modelling Worst Case Well Discharge (7745-650-REP-0030) December 2023
- Reindeer Platform – Vessel Collision: MDO/MGO Surface Release TFN (7745-650-REP-0031), January 2024

Stochastic hydrocarbon dispersion and fate modelling undertaken to inform the environmental impact and risk assessment and to assist with emergency planning was based on preliminary maximum release volumes provided in the technical file note.

Table 7-6: Summary of maximum credible spill scenarios

Maximum Credible Spill Scenario	Hydrocarbon Type	Maximum Credible Volume	Comment	EP Section
Scenario 1 Surface release: Hydrocarbon spill from a loss of well containment at the WHP.	Gas/Condensate	4,029 m^3 over 70 days	Maximum credible volume modelled – with highest flow potential derived by combining the most optimistic reservoir flow parameters for the wells.	7.5.6.5
Scenario 2 Subsea release: Hydrocarbon spill from a loss of pipeline containment near the Commonwealth State Boundary.	Condensate	121.4 m^3 over 3.71 hours		7.7
Scenario 4 Surface release: Hydrocarbon spill over 1 hour following a vessel collision at the WHP	Marine diesel oil	325 m^3	Maximum credible volume based on predicted largest fuel tank on support vessel.	7.8
Scenario 5 Surface release: Hydrocarbon spill over 1 hour following a vessel collision at the CSB.	Marine diesel oil	325 m^3	Maximum credible volume based on predicted largest fuel tank on support vessel.	7.8

Note: Scenarios 3 and 6 are locations in State waters and are therefore not described in this EP.

7.5.3 Spill modelling overview

To determine the spatial extent of impacts from a potential hydrocarbon spills from the Reindeer facilities and associated activities modelling was completed by RPS (RPS, 2024).

Stochastic spill modelling was performed using a number of simulated environmental conditions from winter, summer and transitionary seasons. The stochastic model was run for a total of 300 simulations, 100 for each of the three seasons (winter, summer and transitionary). The 'spill time' for each simulation as randomly varied therefore varying meteorological and oceanographical characteristics applied to the spill. The outputs of this modelling showed a number of different possible spill outcomes of a spill which were then analysed to determine the concentrations of hydrocarbon at each grid cell of the model providing information about the probability of contact and concentration at contact of hydrocarbons across the whole EMBA. The tidal modal domain has been sub-gridded to a resolution of 500 m for shallow and coastal regions, starting from an offshore (Deep water) resolution of 8 km. The finer grids were allocated in a step-wise fashion to resolve flows more accurately along the coastline, around islands and over regions with more complex bathymetry.

Deterministic modelling was also performed to inform operational and scientific monitoring from a single spill event. The deterministic model took a single run selected from the stochastic analysis that represented a single trajectory of a hydrocarbon spill.

The outcomes of this modelling are described in Sections 7.5.6.5 to 7.8.

7.5.4 Hydrocarbon characteristics

Table 7-7 provides a summary of these oil characteristics, of hydrocarbons relevant to the credible spill scenarios identified for the activity.

It's noteworthy that the heavier components for the condensate and MDO, specifically the low volatile and persistent portions, will have a strong tendency to become entrained into the water column in the presence of moderate winds (>10 knots) and in turn breaking waves; however, it can resurface under calm conditions (<10 knots).

Table 7-7: Characteristics of hydrocarbons (RPS, 2024)

Hydrocarbon	Hydrocarbon Classification (AMSA, 2015)	Initial density (kg/m^3)	Viscosity (cP) @ 25oC	Component	Volatiles	Semi-volatiles	Low volatility	Residual
				Boiling Point (°C)	<180 C4-C10	180–265 C11-C15	265–380 C16-C20	>380 >C20
					Non-Persistent			Persistent
Reindeer Condensate 2023[1]	Group I	784.2 @ 15 °C	0.683 @ 20 °C		74	17	8	1
Diesel	Group II	890 @15 °C	14 @ 25 °C		4	32	54	10

1 *Properties from Reindeer Condensate Assay Annual Report 2023 (Intertek 2023); current assay*

7.5.4.1 Reindeer condensate

Table 7-7 details the properties of Reindeer Condensate taken from a 2023 Assay Report, as used to inform oil spill modelling presented in the EP. Reindeer condensate (Intertek, 2023) has an API of 48.9, a density of 784.2 kg/m^3 (at 15 °C) and a low viscosity value of 0.683 cP (at 20 °C). Due to its low viscosity, if spilt on the sea surface, the condensate would rapidly spread and thin out.

Based on its boiling point distributions, ~74% of the product, which are the volatile components, is expected to evaporate within the first 12 hours (Boiling point (BP) < 180 °C); a further 17%, the semi-volatiles, should evaporate within the first 24 hours (180 °C < BP < 265 °C); and the low volatile portion (8%) should evaporate over a longer period (265 °C < BP < 380 °C). It is then expected that the remaining 1% shall persist in the marine environment for much longer periods and would be subject to relatively slow degradation. It is categorised as a group I non-persistent oil according to the AMSA (2023) classifications.

The condensate has a low asphaltene content (<0.5%), indicating a very low propensity to take up water to form water-in-oil emulsion.

7.5.4.2 Marine diesel

The MDO has a density of 890.0 kg/m^3 at 15 °C (API of 27.5) and a low pour point of −9.0 °C. The low viscosity (14.0 cP at 25 °C) indicates that this oil will spread quickly when released and will form a thin to low thickness film on the sea surface, increasing the rate of evaporation (Table 7-7).

Generally, about 4% of the MDO mass should evaporate within the first 12 hours (BP < 180 °C); a further 32% should evaporate within the first 24 hours (180 °C < BP < 265 °C); and an additional 54% should evaporate over several days (265 °C < BP < 380 °C). Approximately 10% (by mass) of MDO will not evaporate, though will decay slowly over time.

7.5.5 Hydrocarbon exposure values

To inform the impact assessment it is important to understand the concentrations of hydrocarbons within the EMBA after a spill. To do this NOPSEMA recommends identifying hydrocarbon exposure values that broadly reflect the range of consequences that could occur at certain concentrations (NOPSEMA, 2019). The exposure values that have been applied to this EP are described below.

The EMBA shown in Figure 3-1 was identified using low exposure values for all four spill scenarios that have been modelled. These low exposure values are not considered to be representative of a biological impact, but they are adequate for identifying the full range of environmental receptors that might be contacted by surface and/or subsurface hydrocarbons [NOPSEMA 2019]).

To inform impact assessment, exposure values that may be representative of biological impact have also been identified. These are called “moderate exposure values” and “high exposure values”. Moderate and high exposure values are modelled for each fate of hydrocarbon to identify what contact is predicted for surface (floating oil), subsurface (entrained oil and dissolved aromatic hydrocarbons), and shoreline accumulation of hydrocarbon at sensitivities.

Determining exposure values that may be representative of biological impact is complex since the degree of impact will depend on the sensitivity of the receptors contacted, the duration of the exposure and the toxicity of the hydrocarbon type making the contact. The toxicity of a hydrocarbon will also change over time, due to weathering processes altering the composition of the hydrocarbon. To identify appropriate exposure values Santos have considered the advice provided by NOPSEMA Bulletin #1 Oil Spill Modelling (April 2019) and scientific literature. The selected hydrocarbon exposure values are discussed in Table 7-8, Table 7-9, Table 7-10 and Table 7-11, these tables explain how the exposure value is relevant to the risk evaluation and provides context on how that exposure value is used to inform response planning (which is addressed further in the OPEP).

Table 7-8: Floating hydrocarbons exposure values

Surface Oil Concentration (g/m2)	Exposure Value	Description
1	Low	**Risk Evaluation** It is recognised that a lower floating oil concentration of 1 g/m^2 (equivalent to a thickness of 0.001 mm or 1 ml of oil per m^2) is visible as a rainbow sheen on the sea surface. Although this is lower than the exposure value for ecological impacts, it may be relevant to socio-economic receptors and has been used as the exposure value to define the spatial extent of the environment that might be contacted (EMBA) from floating oil. **Response Planning** Contact at 1 g/m^2 (as predicted by oil spill trajectory modelling) is used as a conservative trigger for activating scientific monitoring plans as detailed in the OPEP.
10	Moderate	**Risk Evaluation** There is a paucity of data on floating oil concentrations with respect to impacts to marine organisms. Hydrocarbon concentrations for registering biological impacts resulting from contact of surface slicks have been estimated by different researchers at about 10–25 g/m^2 (French et al., 1999; Koops et al., 2004; NOAA, 1996). The impact of floating oil on birds is better understood than on other receptors. A conservative exposure value of 10 g/m^2 has been applied to impacts from surface hydrocarbons (floating oil) in this EP. Although based on birds, this hydrocarbon exposure value is also considered appropriate for turtles, sea snakes and marine mammals (NRDAMCME, 1997). **Response Planning** Contact at 10 g/m2 is not specifically used for spill response planning.
50	High	**Risk Evaluation** At greater thicknesses, the potential for impact of floating oil to wildlife increases. All other things being equal, contact to wildlife by surface oil at 50 g/m^2 is expected to result in a greater impact.50 **Response Planning** Containment and recovery effectiveness drop significantly with reduced oil thickness (McKinney et al. 2017; NOAA 2014). McKinney et al. (2017) tested the effectiveness of various oil skimmers at various oil thicknesses. Their results showed that the oil recovery rate of skimmers dropped significantly when oil thickness was less than 50 g/m^2 -(less than Bonn Agreement Code 4). Hence, 50 g/m^2 has been set as a guide for planning effective containment and recovery operations. Similarly, surface oil >50 g/m^2 (Bonn Agreement Code 4/5 and equivalent to oil observed as discontinuous or continuous true colour) is considered to be a lower limit for effective dispersant operations and is therefore considered for planning.

Table 7-9: Shoreline hydrocarbon accumulation exposure values

Shoreline Accumulation (g/m2)	Exposure Value	Description
10	Low	**Risk Evaluation** An accumulated concentration of oil above 10 g/m^2 on shorelines is considered to represent a level of socio-economic effect (NOPSEMA, 2019). – e.g. reduction in visual amenity of shorelines. This value has been used in previous studies to represent a low contact value for interpreting shoreline accumulation modelling results (French-McCay, 2005, 2006). **Response Planning** Not specifically used for response planning because below the limit that can be effectively cleaned.
100	Moderate	**Risk Evaluation** The impact exposure value for exposure to hydrocarbons stranded on shorelines is derived from levels likely to cause adverse impacts to marine or coastal fauna and habitats. These habitats and marine fauna known to use shorelines are most at risk of exposure to shoreline accumulations of oil, due to smothering of intertidal habitats (such as mangroves and emergent coral reefs) and coating of marine fauna. Environmental risk assessment studies (French-McCay, 2009) report that an oil thickness of 0.1 mm (100 g/m^2) on shorelines is assumed as the lethal exposure value for invertebrates on hard substrates (rocky, artificial or man-made) and sediments (mud, silt, sand or gravel) in intertidal habitats. Therefore, a conservative exposure value for impacts of 100 g/m^2 has been applied to impacts from shoreline accumulation of hydrocarbons. **Response Planning** A shoreline concentration of 100 g/m^2, or above, is likely to be representative of the minimum limit that the oil can be effectively cleaned according (AMSA, 2015; NOPSEMA, 2019) and is therefore used as a guide for shoreline clean-up planning. This exposure value equates to approximately ½ a cup of oil per square metre of shoreline contacted.
1,000	High	**Risk Evaluation** At greater thicknesses, the potential for impact of accumulated oil to shoreline receptors increases. All other things being equal, accumulation of oil above 1000 g/m^2 is expected to result in a greater impact. **Response Planning** As oil increases in thickness the effectiveness of oil recovery techniques increases. This value can therefore be used to prioritise oil recovery efforts, assuming oil recovery is deemed to have an environmental benefit.

Table 7-10: Dissolved aromatic hydrocarbon exposure values

Dissolved hydrocarbons (ppb)	Exposure Value	Description
10	Low	**Risk Evaluation** Dissolved Aromatic Hydrocarbons include the monoaromatic hydrocarbons (MAHs) (compounds with a single benzene ring such as BTEX [benzene, toluene, ethyl benzene, and xylenes]) and polycyclic aromatic hydrocarbons (PAHs) (compounds with multiple benzene rings such as naphthalenes and phenanthrenes). These compounds have a greater bioavailability that other components of oil and are considered to be main contributors to oil toxicity. The toxicity of DAHs is a function of the concentration and the duration of exposure by sensitive receptors with greater concentration and exposure time causing more sever impacts. Typically tests of toxicity done under laboratory conditions measure toxicity as proportion of test organisms affected (e.g. 50% mortality or LC50) at the end of a set time period, often 48 or 96 hours. French-McCay (2002) in a review of literature, reported LC50 for dissolved PAHs with 96 h exposure, range between 30 ppb for sensitive species (2.5th-percentile species) and 2,260 ppb for insensitive species (97.5th-percentile species), with an average of about 250 ppb. The range of LC50s for PAHs obtained under turbulent conditions (this includes fine oil droplets) was 6 ppb to 410 ppb with an average of 50 ppb (French-McCay, 2002). More recently, French-McKay (2018) described in-water thresholds as 10–100 µg/L (equivalent to ppb). Regarding the effect of UV on PAH toxicity, French-McKay et al (2018) uses the findings of DWH NRDA Trustees (2016) to adjust for this affect by reducing the water column exposure thresholds by 10x in the top 20 m of the water column. The dissolved hydrocarbon 10 ppb exposure value has been used to inform the EMBA within Sections 7.6, 7.7and 7.8. An exposure value of 10 ppb is appropriate as it is concentration that could have some potential negative effect on marine organisms. **Response Planning** Contact at 10 ppb (as predicted by oil spill trajectory modelling) is used as a trigger for activating scientific monitoring plans as detailed in the OPEP. Establishes planning area for scientific monitoring based on potential for exceedance of water quality triggers (NOPSEMA, 2019).
50	Moderate	**Risk Evaluation** Approximates potential toxic effects, particularly sublethal effects to sensitive species (refer to above text). Consistent with NOPSEMA (2019). For most marine organisms, a concentration of between 50 and 400 ppb is considered to be more appropriate for risk evaluation. **Response Planning** Encompassed by response to 10 ppb. There is no different response planning for higher exposure values.
400	High	**Risk Evaluation** Approximates toxic effects including lethal effects to sensitive species (NOPSEMA, 2019). **Response Planning** Encompassed by response to 10 ppb. There is nothing different for higher exposure values

Table 7-11: Entrained hydrocarbon exposure values

Entrained hydrocarbons (ppb)	Exposure Value	Description
1000	Low / Moderate	**Risk Evaluation** Entrained hydrocarbons, as opposed to dissolved aromatic hydrocarbons (DAHs), are oil droplets suspended in the water column. Factors including bioavailability of constituents in the oil, changing composition of the oil as it weathers, and likelihood and duration of exposure all contribute to the dynamic nature of entrained and dissolved oil aquatic toxicity at any given time in an oil spill scenario. In relatively fresh oil, some of the hydrocarbons in entrained oil droplets are soluble/semi-soluble that may later dissolve and become bioavailable. Polycyclic aromatic hydrocarbons (PAHs) and related compounds present in fresh oil are the most toxic components (as described in Table 7-10). However, entrained oil droplets weather rapidly because of their high surface area relative to their volume. As oil weathers, the potentially toxic components diminish (via volatisation, dissolution and biodegradation) to the point where entrained droplets are effectively non-toxic (French-McCay et al. 2023; Parkerton et al. 2023). Therefore, effects levels for the bioavailable, soluble and semi-soluble components should not be applied to whole oil entrained droplets, particularly for weathered entrained oil droplets. Entrained hydrocarbons still have potential effects on marine organisms through direct contact with exposed tissues and ingestion (NRC 2005). However, research has not definitively demonstrated direct effects of whole-oil droplets as separable from the effects of toxic components dissolved from the oil (Parkerton et al. 2023), and the level of exposure causing effects is considered to be significantly higher than for DAHs (NASEM 2020; French-McCay 2016, 2024). A review by French-McCay (2024) on considerations for the development of entrained oil thresholds for oil spill risk assessments, recommends entrained thresholds based on total hydrocarbon content (THC) and related compounds. However, given the variable composition of entrained oil as it weathers, the development of effects levels or thresholds based on THC is acknowledged to be problematic (French-McCay 2024). Crude oils typically contain about 1% PAHs by mass (French-McCay 2002; Forth et al. 2017), therefore the sublethal concentration threshold (predicted no-effect concentration [PNEC]) expressed as THC based on the most toxic components would be ~100 ppb (100 µg/L) for fresh oil (French-McCay 2016). However, as oil weathers, PAHs are lost to volatisation, dissolution and biodegradation, thus making application of this threshold to entrained oil droplets overly conservative (as described above). In addition, exposure durations in the sea are brief, order of minutes to hours, not days or longer as used in most bioassay studies (Bejarano et al. 2017). Effects levels are orders of magnitude higher for exposure durations of less than 24 hours (French-McCay 2002). Given these considerations, French-McCay (2024) suggests 1,000 ppb to be sufficiently conservative for entrained oil droplets of all oil types and all weathering states. This is supported by a number of toxicity studies including a review by Bejarano et al. (2017), which identified THC lethal effects levels of 3-28 mg/L (3,000–28,000 ppb) for a range of oils and states of weathering for aquatic species from all geographical areas globally. An exposure concentration of 1,000 ppb of measurable Total Petroleum Hydrocarbon (TPH) was deemed a low level of concern for sensitive life stages in marine organisms by Kraly et al. (2001). In reviews by NRC (2005) and NASEM (2020), 1,000 ppb was similarly found to be at the low end of the range where sub-lethal impacts from acute exposure have been observed. Correcting for the fact that TPH measurements are on a portion of the oil and not the full oil (i.e. THC), this indicates a threshold of 3,000 ppb would be appropriate for modelled entrained oil. Thus, French-McCay (2024) concludes that a THC threshold of 3,000 ppb is an appropriate threshold for crude oils and 1,000 ppb for light distillates and condensates for use in risk assessments and for use in defining an EMBA with other oil phases. Santos has therefore adopted the use of a low/moderate entrained oil threshold of 1,000 ppb for use in risk assessments and for defining an EMBA and MEVA to ensure conservatism.

7.5.6 Spill risk assessment approach

The spill risk assessment approach adopted is based on Santos' Oil Spill Risk Assessment and Response Planning Procedure (QE-91-II-20003). The procedure describes the spill risk assessment process as follows:

A consistent risk assessment approach is applied to each unplanned hydrocarbon release scenario in Section 7.5 to Section 7.8). The spill risk assessment approach is based on Santos' Oil Spill Risk Assessment and Response Planning Procedure (QE-91-II-20003). The procedure describes the spill risk assessment process as follows:

1. Identify the spatial extent of the environment that may be affected (the EMBA) This has been completed for this EP as part of the assessment of the existing environment and receptors that are known to occur or may occur within the EMBA are described in Section 3 and Appendix C.
2. Identify areas of high environmental value (HEV) within the EMBA (HEVs are described in Section 7.5.6.2).
3. Identify and then risk assess hot spots. Hotspots are effectively a subset of HEVs, and their determination is described in Section 7.5.6.3.
4. Identify priorities for protection (for consideration of spill response strategies in the OPEP).

Across all marine hydrocarbon spill risks associated with the Reindeer facilities and associated activities, the surface release of Reindeer condensate from a complete loss of well control has the greatest worst case volume (refer Table 7-6), however the spatial extent and potential for impacts is also driven by the two diesel spill scenarios. A hotspot consequence workshop was completed on 21 May 2024 for all the spill scenarios selected. This provides a detailed assessment of the worst-case impacts from an accidental oil spill associated with the activity.

7.5.6.1 Spill EMBA

Defining the EMBA by an oil spill is the first step in oil spill risk assessment. For activities where there is the potential for multiple spill scenarios, the spill scenario, or combination of spill scenarios, resulting in the greatest spatial extent of impacts is used to define the overall EMBA for the activity. The EMBA is further described in Section 3.1.

7.5.6.2 Areas of high environmental value

Santos has predetermined areas of HEV along the Western Australian coastline by ranking these areas based on:

- Protected area status – This is used as an indicator of the biodiversity values contained within that area, where a World Heritage Area, Ramsar Wetland and Marine Protected Area will score higher than areas with no protection assigned
- BIAs of listed threatened species – These are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour, such as breeding, feeding, resting or migration. Each one of these within the predefined areas contributes to the score.

Further input to determine areas of HEV included:

- Sensitivity of habitats to impact from hydrocarbons in accordance with the guidance document Sensitivity Mapping for Oil Spill Response produced by IPIECA, the International Maritime Organisation and International Association of Oil and Gas Producers
- Sensitivities of receptors with respect to hydrocarbon-impact pathways
- Status of zones within protected areas (i.e. IUCN (1a) and sanctuary zones compared to IUCN (VI) and multiple use zones)
- Listed species status and predominant habitat (surface versus subsurface)
- Social values; i.e. socio-economic and heritage features (e.g. commercial fishing, recreational fishing, amenities, aquaculture).

Tallied scores for each predefined area along the Western Australian coastline were then ranked from 1 to 5, with an assignment of 1 representing areas of the highest environmental value and those with 5 representing the areas of the lowest environmental value.

7.5.6.3 Hot spots

While the entire EMBA will be considered during risk assessment and spill response planning, it is best practice to concentrate greatest effort and level of detail on those parts of the EMBA that have:

- The greatest intrinsic environmental value – i.e. HEV areas ranked 1–3
- The highest probability of contact by oil at least ≥5% (either floating, entrained or dissolved aromatic)
- The greatest potential concentration or volume of oil potentially arriving at the area.

These areas are termed ‘Hot Spots’. Defining Hot Spots is typically the first step in undertaking detailed spill risk assessment and spill response planning. Hot Spots are a subset of HEV areas that:

- Have the highest probability of contact (at least higher than 5%) above the impact assessment exposure value for surface hydrocarbons and shoreline accumulation based on modelling results
- Receive the greatest concentration or volume of oil, either floating or stranded oil, entrained oil or dissolved aromatic hydrocarbons above contact exposure values described in Section 7.5.5.
- Additional areas may be selected as Hotspots for detailed risk assessment, for example if stakeholder consultation has identified areas of particular concern that are not already included in the risk assessment. Additional discretionary hotspots may also be included where they do not strictly meet all of the criteria of a hotspot e.g. a HEV ranked 1-3 with <5% probability, or a HEV ranked 4 or 5 with >5% probability, depending on the concentrations and volumes of hydrocarbons presented in the modelling report. When a discretionary hotspot is added it will be identified as ‘discretionary’ and the rationale for its inclusion as a hotspot will be described.

7.5.6.4 Priorities for protection

For the purposes of a spill response preparedness strategy, it is not necessary for all Hot Spots to have detailed planning. For example, wholly submerged Hot Spots may only be contacted by entrained oil, and the response would be largely to implement scientific monitoring to determine impact and recovery. Hot Spots with features that are not wholly submerged (i.e. emergent features) should have specific spill response planning conducted. This final determination of ‘Priority for Protection’ sites, for the oil spill response strategy, is based on the worst-case estimate of floating oil concentration, shoreline loading and minimum contact time at exposure value concentrations. An assessment of each protection priority will be undertaken to determine the most appropriate spill response strategies based on the type of oil and the values of the protection priority area. This can be done through a strategic NEBA approach.

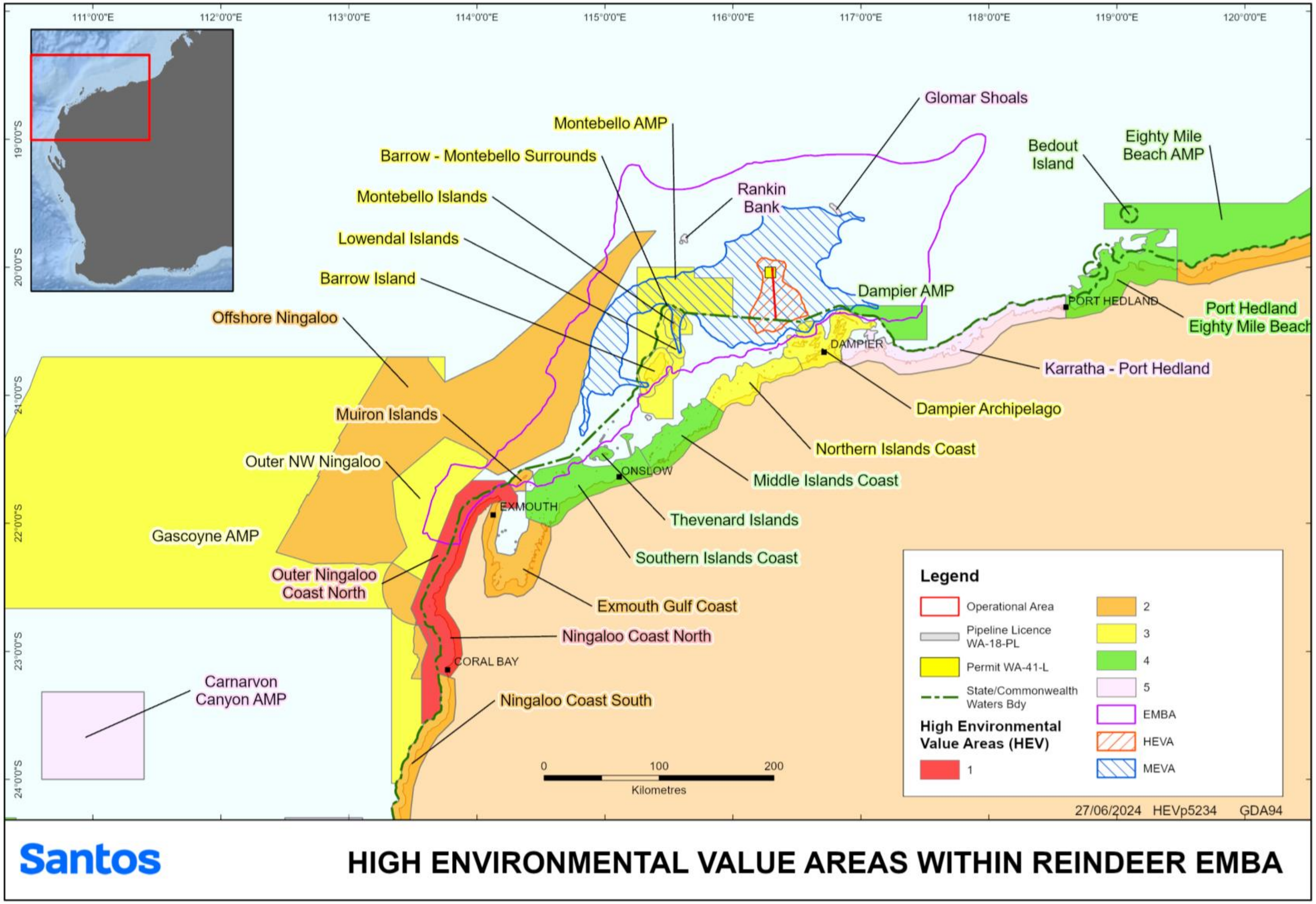


Figure 7-1: High environmental value areas

7.5.6.5 Potential hydrocarbon impact pathways

To help inform the hydrocarbon spill risk assessment receptors within the EMBA and potential impact pathways have been defined (Table 7-12). The potential impact pathways consider physical and chemical pathways. Physical pathways include contact from floating oil, accumulated shoreline oil, or entrained oil droplets. Chemical pathways include ingestion, inhalation or contact from any hydrocarbon phase. These are summarised in Table 7-12 and the information is drawn upon within the hydrocarbon risk assessment for each spill scenario (Sections 7.5.6.5 to 7.8.). Table 7-13 further describes the nature and scale of the hydrocarbon spills for this activity on marine fauna and socio-economic receptors found within the EMBA and moderate exposure value.

Table 7-12: Physical and chemical pathways for hydrocarbon exposure and potential impacts for receptors

Receptor	Physical Pathway	Potential Impacts	Chemical Pathway	Potential Impacts
Rocky shorelines	Shoreline loading and attachment may result in thin and sporadic coating of hydrocarbon residues. Degree of oil coating depends on the energy of the shoreline area, the type of the rock formation and continual weathering of the oil.	Impacts to flora (mangroves) and fauna further described below.	Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation	Impacts to flora (mangroves) and fauna further described below.
Sandy beaches	Shoreline loading and water movement may allow hydrocarbon residue to filter down into sediments, continue to biodegrade on the surface or remobilise into the surf zone. Degree of loading depends on the energy and tidal reach of the shoreline, the type of the sandy shore and continual weathering of the oil.	Indirect impacts to nesting and foraging habitats for birds and turtles. Direct impacts to infauna.	Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation	Indirect impacts to nesting and foraging habitats for birds and turtles. Direct impacts (mortality) to infauna through toxic effects and smothering.
Intertidal platforms	Shoreline loading and water movement may allow hydrocarbon residue to filter down into sediment, continue to biodegrade on the surface or remobilise into the surf zone. Degree of loading depends on the energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil.	Indirect impacts to foraging habitats for birds and turtles. Direct impacts to infauna.	Chemical pathway to fauna and flora via adsorption through cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation	Indirect impacts to foraging habitats for birds. Direct impacts (mortality) to infauna through toxic effects and smothering.
Shallow sub-tidal soft sediments	Hydrocarbon residue in the shallow waters adjacent to shorelines may settle to filter down into sediments. Degree of loading is dependent upon the	Indirect impacts to foraging habitats for turtles and fish. Direct impacts to infauna.	Adsorption via cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation.	Indirect impacts to foraging habitats for turtles and fish. Direct impacts (mortality) to infauna through toxic effects and smothering.

Receptor	Physical Pathway	Potential Impacts	Chemical Pathway	Potential Impacts
	energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil.			
Mangroves	Coating of root system may reduce air and salt exchange. Degree of coating depends on the energy and tidal reach of the shoreline, the type of the substrate and continual weathering of the oil.	Yellowing of leaves. Defoliation. Increased sensitivity to stressors. Tree death. Reduced growth. Reduced reproductive output. Reduced seed viability.	External contact by oil and adsorption across cellular membranes.	Yellowing of leaves. Defoliation. Increased sensitivity to stressors. Tree death. Reduced growth. Reduced reproductive output. Reduced seed viability. Growth abnormalities.
Seagrass and macroalgae	Coating of leaves or thalli may reduce light availability and gas exchange. Degree of coating depends on the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil.	Bleaching or blackening of leaves. Defoliation. Reduced growth.	External contact by oil and adsorption across cellular membranes.	Mortality. Bleaching or blackening of leaves. Defoliation. Disease. Reduced growth. Reduced reproductive output. Reduced seed or propagule viability.
Hard corals (coral reefs)	Coating of polyps and shading may result in reduction of light availability. Degree of coating depends on the metocean conditions, dilution, whether corals are emergent at all and continual weathering of the oil.	Bleaching. Increased mucous production. Reduced growth.	External contact by oil and adsorption across cellular membranes.	Mortality. Cell damage. Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth. Reduced reproductive output. Reduced egg or larval success. Growth abnormalities.
Non- coral benthic invertebrates	Coating of adults, eggs and larvae. Degree of coating depends on the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil.	Mortality. Behavioural disruption. Impaired growth.	Ingestion and inhalation. External contact and adsorption across exposed skin and cellular membranes. Uptake of dissolved aromatic hydrocarbons across cellular membranes. Reduced mobility and capacity for oxygen exchange.	Mortality. Cell damage. Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth. Reduced reproductive output. Reduced egg or larval success. Growth abnormalities. Behavioural disruption.
Fish, including sharks and rays	The coating of adults, but primarily eggs and larvae causes reduced mobility and	Mortality. Oxygen debt. Starvation.	Ingestion. External contact and adsorption across exposed	Mortality. Cell damage. Flesh taint.

Receptor	Physical Pathway	Potential Impacts	Chemical Pathway	Potential Impacts
	reduced capacity for oxygen exchange.	Dehydration. Increased predation. Behavioural disruption.	skin and cellular membranes. Uptake of dissolved aromatic hydrocarbons across cellular membranes (e.g. gills).	Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth. Reduced reproductive output. Reduced egg or larval success. Growth abnormalities. Behavioural disruption.
Birds (seabirds and shorebirds)	Degree of coating depends on the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil.	Feather and skin irritation and damage, with the potential to cause secondary impacts such as: • Physical restriction of flight and swimming movement. • Mortality. • Hypothermia / impairing the waterproofing of feathers. • Disruption to feeding / starvation. • Disruption to breeding. • Disruption to migration.	Ingestion (during feeding or preening). External contact and adsorption across exposed skin and membranes.	Mortality. Cell damage, lesions. Secondary infections. Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth. Reduced reproductive output. Growth abnormalities. Behavioural disruption.
Marine reptiles	Degree of coating depends on the energy and tidal reach of the shoreline, the type of the receptor and continual weathering of the oil.	Irritation of eyes/mouth and potential illness, which may cause secondary impacts such as: • Mortality. • Disruption to feeding / starvation • Physical restriction • Behavioural disruption.	Inhalation. Ingestion. External contact and adsorption across exposed skin and membranes.	Mortality. Cell damage, lesions. Secondary infections. Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth. Reduced hatchling success. Reduced reproductive output. Growth abnormalities. Behavioural disruption.
Marine mammals	Fur damage and matting, reduced mobility and buoyancy (for applicable species). Coating of feeding apparatus in some species (i.e. baleen whales).	Irritation of eyes/mouth, damage to fur and potential illness, which may cause secondary impacts such as: • Mortality. • Disruption to feeding / starvation. • Physical restriction.	Inhalation. Ingestion. External contact and adsorption across exposed skin and membranes.	Mortality. Cell damage, lesions. Secondary infections. Reduced metabolic capacity. Reduced immune response. Disease. Reduced growth.

Receptor	Physical Pathway	Potential Impacts	Chemical Pathway	Potential Impacts
		• Behavioural disruption		Reduced reproductive output. Growth abnormalities. Behavioural disruption.
Plankton	Coating of feeding apparatus. Reduced mobility and capacity for oxygen exchange.	Mortality. Behavioural disruption (for example, reduced mobility).	• Inhalation. • Ingestion. • External contact.	• Mortality. • Impairment of biological activities (for example, feeding, respiration). • Reduced mobility.
Water quality and sediment quality	Presence of hydrocarbon residue in the water, which may filter down to sediments or continue to biodegrade on the surface. Degree of loading in the water column is dependent upon the influence of wave energy and tidal range.	Impacts to flora and fauna, as discussed in rows above.	Adsorption via cellular membranes and soft tissue, ingestion, irritation/burning on contact and inhalation. Impacts to flora and fauna, as discussed in rows above.	Impacts to flora and fauna, as discussed in rows above.
Protected areas	Coating of benthic habitats, shoreline habitats and marine fauna/flora within protected areas as discussed in rows above.	• Mortality, injury or behavioural disruption to marine fauna. • Death or impairment of habitats within protected areas. • Reduction in the quality of the marine environment within protected areas. • Environmental value of protected areas is degraded.	Impacts to flora and fauna, as discussed in rows above.	• Mortality, injury or behavioural disruption to marine fauna. • Death or impairment of habitats within protected areas. • Reduced growth of benthic habitats. • Reduction in the quality of the marine environment within protected areas. • Environmental value of protected areas is degraded.
Socio-economic environment (fisheries, tourism, shipping, defence, shipwrecks, Indigenous users, oil and gas)	Presence of hydrocarbon residue in the water, which may filter down to sediments or continue to biodegrade on the surface. Coating of benthic habitats, shoreline habitats and marine fauna/flora within protected areas as discussed in rows above.	• Degradation of cultural or maritime heritage sites. • Disruption to tourism, recreation or shipping activities. • Reduction in resource available for commercial and recreational fisheries.	• Impacts to flora, fauna and the physical environment as discussed in rows above. • Commercial/recreational fish species – refer to 'fish' as discussed above.	• Degradation of cultural or maritime heritage sites. • Disruption to tourism, recreation or shipping activities. • Reduction in resource available for commercial and recreational fisheries.

Table 7-13: Nature and scale of hydrocarbon spills on environment and socio-economic receptors

Receptor	Nature and Scale of Hydrocarbon Spills
Marine fauna	
Marine mammals	• Seventeen migratory marine mammal species were identified by the EPBC Protected Matters search for the EMBA (Appendix C). Of these, two are listed as endangered (blue whale and southern right whale) and three as vulnerable (Great white shark, fin whale and sei whale). • The humpback whale BIA for migration and the pygmy blue whale BIAs distribution are within the extent of the moderate exposure value for from the worst-case credible spill. • Other migratory marine mammals may encounter either surface or water-column hydrocarbons within the extent of the moderate exposure value; Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces. however, in the absence of any known feeding, resting or breeding areas, significant numbers are unlikely to be contacted. • Lethal or sublethal physical and toxic effects such as irritation of eyes or mouth and potential illness may occur from hydrocarbon spills. However, it is commonly thought that condensate does not cause problems for wildlife due to the lack of visible oiling, however, may be toxic (WAOWRP, 2014).
Marine reptiles	• Nine species of threatened marine reptile were identified as possibly being contacted by a spill. Short-nosed sea snake, flatback, hawksbill, leatherback, green and loggerhead turtles are widely dispersed at low densities across the North West Shelf; and in the unlikely event of a hydrocarbon spill occurring, individuals traversing open water may come into contact with water-column or surface hydrocarbons. • BIAs for the flatback turtle, green turtle, hawksbill turtle, olive ridley turtle and loggerhead turtle all are within the extent of the moderate exposure value from the worst case credible spills. • Lethal or sublethal physical and toxic effects such as irritation of eyes or mouth and potential illness may occur from hydrocarbon spills. However, it is commonly thought that condensate does not cause problems for wildlife due to the lack of visible oiling, however, may be toxic (WAOWRP, 2014). • At risk of direct contact with condensate due to chance of surfacing within slick. Effects include irritation of eyes or mouth and potential illness. Surface respiration could lead to accidental ingestion of hydrocarbons or result in the coating of sensitive epidermal surfaces.
Fish, sharks and rays	• Nine threatened species of fish, sharks and rays are known to or may occur in the EMBA. Of these whale sharks are the only species with a BIA that intersects the moderate exposure value. However, the main whale shark aggregation location is Ningaloo Marine Park which does not intercept the moderate exposure value. • Given the absence of critical habitat for most of the threatened species within the EMBA, significant numbers are not expected to be exposed to hydrocarbons in the event of a spill. • Hydrocarbon droplets can physically affect fish and sharks exposed for an extended duration (weeks to months). Smothering through coating of gills can lead to the lethal and sublethal effects of reduced oxygen exchange, and coating of body surfaces may lead to increased incidence of irritation and infection. Fish may also ingest hydrocarbon droplets or contaminated food leading to reduced growth. • The operational area and EMBA overlap with the whale shark foraging BIA. The EPBC Act–listed whale shark occurs in the region particularly around the time of aggregation events off the Ningaloo coast between April and June. This species is oceanic but also comes into shore and feeds in surface waters, which often coincide with specific productivity events that are a focus of feeding for the animals. It is therefore possible that surface, entrained and dissolved aromatic hydrocarbon could come in contact with or be ingested by the species if whale sharks are migrating in the area at the time. However, given the distance to the whale shark aggregation location, significant impacts to whale shark are not expected should a spill occur. • There is potential for localised mortality of fish eggs and larva due to reduced water quality and toxicity. Effects will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest; therefore, demersal fish communities are not expected to be impacted.

Receptor	Nature and Scale of Hydrocarbon Spills
	• While fish and sharks do not generally break the sea surface, individuals may feed at the surface. However, since the condensate is expected to quickly disperse and evaporate (modelling results indicate a significant proportion of the oil mass from the water surface evaporates within 24 hours at moderate wind speeds), the probability of prolonged exposure to a surface slick by fish and shark species is low.
Seabirds and shorebirds	• Sixteen threatened species of seabirds and shorebirds were identified by the EPBC Protected Matters database search as being within the EMBA (Appendix C). Five of these (lesser frigate bird, wedge-tailed shearwater, roseate tern, fairy tern and lesser crested tern) have BIAs that overlap the moderate exposure value. • Surface and entrained condensate/diesel is unlikely to contact nesting or egg-laying individuals in colonies; however, it is possible that individuals could come in contact with surface, entrained or dissolved aromatic hydrocarbons while foraging. • Seabirds may encounter entrained condensate while diving and foraging. • Shorebirds may encounter condensate accumulating on shorelines above the exposure value of 100 g/m at feeding, roosting and breeding sites.
Plankton (including zooplankton and fish and coral larvae)	The EMBA has the potential to overlap with spawning of some fish species given the year-round spawning of some species. In the unlikely event of a spill occurring, fish larvae may be contacted by hydrocarbons (condensate, diesel) entrained in the water column.
KEFs	Key ecological features within the MEVA are listed below: • Ancient coastline at 125 m depth contour • Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula • Continental Slope Demersal Fish Communities • Glomar Shoals • Surface hydrocarbons result in a localised reduction in water quality in the upper surface waters of the water column (particularly the top 10 m). Therefore, hydrocarbon contact to the habitats of the KEFS from a surface release is not considered likely. • Entrained and dissolved aromatic hydrocarbons have potential to contact KEFs and the ecological features associated with the KEFs i.e. Fish assemblages and benthic habitats. • Some KEFs may contain corals. In the worst instance, direct contact to corals by surface or entrained hydrocarbon could lead to smothering and reduced capacity for photosynthesis or to chemical toxicity across cellular structures, leading to coral bleaching or colony death. Direct contact by dissolved aromatic hydrocarbons can cause lethal and sublethal effects in corals, depending on the time and duration of exposure of the concentrations, with sublethal effects, including decreased growth rates and reduced reproductive success. As with corals, intertidal and subtidal macroalgae and seagrass could be impacted by surface or entrained hydrocarbons. Impacts could include reduced capability for photosynthesis if the seagrass or macroalgae were smothered or toxic effects could occur from contact with the hydrocarbon. • Impacts due to reduced water quality and toxicity will be greatest in the upper 10 m of the water column and areas close to the spill source where hydrocarbon concentrations are likely to be highest; therefore, demersal fish and other benthic communities are not expected to be impacted.
Socio-economic	
Fisheries	• Several commercial and state fisheries are found within the EMBA and MEVA. • Fisheries may be impacted by surface hydrocarbons and fish stocks may be impacted by entrained and dissolved hydrocarbons. • Condensate in the water column can have toxic effects on fish reducing catch rates and rendering fish unsafe for consumption.
Tourism	• There are many sources of marine-based tourism within the EMBA, and MEVA.

Receptor	Nature and Scale of Hydrocarbon Spills
	• Aquatic recreational activities, such as boating, diving and fishing, occur around the Montebello Islands but are predominantly concentrated in the vicinity of the population centres such as Dampier. • Tourism is expected to be impacted by surface hydrocarbons and exclusion zones surrounding a spill will reduce access for vessels for the duration of the response undertaken for spill clean-up (if applicable) and may prevent water-based tourism activities in certain areas.
Shipping	• A number of shipping fairways intersect the EMBA. • In the event of a hydrocarbon spill chipping activities may be impacted by exclusion zones surrounding a spill. Exclusion zones could reduce access for shipping vessels for the duration of the response undertaken for spill clean-up (if applicable) meaning vessels may have to take detours leading to potential delays and increased costs.
Defence	• Military exercise areas are located at Exmouth and Derby associated with the RAAF Base Learmonth and Curtin, respectively. These training zones overlap the EMBA. However, they have been for aerial training are unlikely to be impacted by a hydrocarbon spill.
Shipwrecks	• There are a number of shipwrecks in the EMBA and the MEVA. • Surface hydrocarbons will have no impact on shipwrecks. • Hydrocarbons in the water column either as entrained oil or dissolved aromatic hydrocarbons may extend several hundreds of kilometres from the release location. The potential for in-water hydrocarbons to impact on shipwrecks is poorly documented; however, it has been proposed that exposure to oil and/or dispersant may alter bacterial community composition (biofilms) inhabiting shipwrecks, possibly altering corrosion potential (Salerno et al., 2016).
Indigenous users	• Marine resource use by indigenous people is generally restricted to coastal waters. Fishing, hunting and the maintenance of maritime culture and heritage through ritual, stories and traditional knowledge continue as important uses of the nearshore region and adjacent areas. • Indigenous users may be impacted by surface hydrocarbons, exclusion zones around spill sites during spill response and fishing and hunting stocks may be impacted by entrained and dissolved hydrocarbons.
Existing oil and gas activity	• Exclusion zones surrounding spills will reduce access, potentially resulting in delays to work schedules with possible subsequent financial implications. In particular, Chevron's Gorgon and WA Oil operations on Barrow Island may be impacted in the event of an unplanned spill event through exclusion or access restrictions in the event of spill response and clean-up activities (if applicable).
Protected areas	Protected areas within the MEVA are summarised below. For full descriptions of these areas refer to Section 3.2.5. <u>National Heritage Listed Areas:</u> • Barrow Island and the Montebello-Barrow Island Marine Conservation Reserve • Dampier Archipelago (including Burrup Peninsula) <u>Australian Marine Parks:</u> • Montebello AMP • Dampier AMP <u>State Marine Parks and Marine Management Areas:</u> • Barrow Island WA Marine Park • Montebello Islands WA Marine Park • Barrow Island Marine Management Area Protected areas are protected based on a number of values and these values can be impacted by both surface and subsurface hydrocarbons.

7.6 Surface release of condensate from the WHP

7.6.1 Description of event

Event	There are currently three production wells at the platform. During well intervention activities (e.g. wire-line activities), the pressure envelope of the well is entered via fit-for-purpose pressure-control equipment at the surface. A loss of well control causing release of condensate at the surface, although very unlikely, is considered credible and represents the worse-case discharge scenario for the production wells during the production lifecycle phase. In this scenario there could be unrestricted flow through the existing well completion and vertical production tree.
Extent	Concentrations of floating oil at, or above, 1 g/m^2 could extend up to 6 km from the release location, with no exposure predicted at, or above, 10 g/m^2 or 50 g/m^2 thresholds. No EVAs were predicted to be exposed to floating oil at, or above 1 g/m^2. No shoreline accumulation was predicted at, or above, the 10 g/m^2 threshold for any sensitive receptors. No entrained hydrocarbon exposure was predicted to occur at, or above, the low/moderate exposure value of 1,000 ppb. Dissolved hydrocarbon concentrations exceeding 10 ppb may potentially occur 362 km from the spill site with the distance reducing to 210 km as the threshold increased to 50 ppb. No concentrations at, or above, the 400 ppb threshold were predicted.
Duration	The above scenario would result in a surface release of an estimated 4,029 m^3 of Reindeer condensate, released for 70 days following a surface LOWC. The well is anticipated to cease flowing shortly after 8 weeks due to low gas rates and high water rates corresponding to high water gas ratios. Further information on the spill modelling is provided in Section 7.6.2.1.

7.6.2 Nature and scale of impacts

Hydrocarbon spills will cause a decline in water quality and may cause physical (e.g. coating of emergent habitats, oiling of wildlife at sea surface) and chemical (e.g. toxic) impacts to marine species (Table 7-12). The severity of the impact of a hydrocarbon spill depends on the magnitude of the spill (i.e. extent, duration) and the sensitivity of the receptor. Given the Diesel and the Condensate are considered light hydrocarbons (Group I and II hydrocarbons, AMSA, 2005), the physical and chemical pathways to impact are comparable. Therefore, both are presented in Table 7-13.

<u>Potential receptors: Intertidal and subtidal habitats, marine and coastal fauna, commercial and recreational fishing, socio-economic receptors, Commonwealth and State marine protected areas</u>

Reindeer Condensate is considered a light hydrocarbon (Group I hydrocarbon under the AMSA classification). In the event of a surface spill, condensate undergoes rapid spreading and evaporative loss in warm waters. As the condensate is more buoyant than water, during a subsea release scenario, any hydrocarbon that rises to float on the sea surface will also undergo the same evaporation and spreading loss. A temporary slick on the sea surface and entrained hydrocarbon in the sea surface layer could have the physical effect of coating fauna interacting within and under the surface slick, including plankton, pelagic invertebrates and fishes, marine reptiles, marine mammals and seabirds, and may also cause slight secondary effects through ingestion after preening for seabirds or through ingestion of oiled fish. In the event that the slick and entrained hydrocarbon reach coastlines and shallow waters, accumulation on shoreline, intertidal and subtidal habitats may also be oiled.

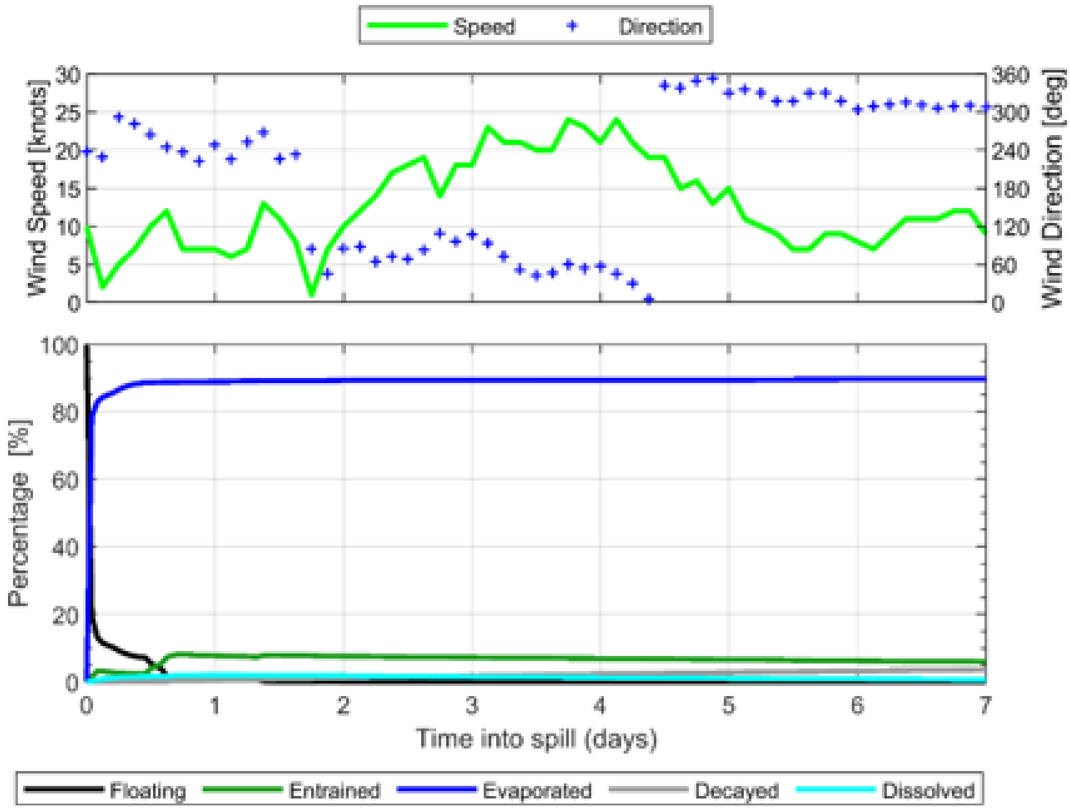
A surface spill could also cause toxic effects to marine fauna within the sea surface layer due to bioavailable aromatic hydrocarbons that dissolve into water from entrained droplets and floating hydrocarbon. A subsea release under pressure, such as a DC supply pipeline rupture scenario described in Section 7.5.1, is expected to have a greater percentage of dissolved aromatic hydrocarbons distributed throughout the water column. These aromatic hydrocarbons, including monocyclic aromatic hydrocarbons and low molecular weight polycyclic aromatic hydrocarbons can cause narcotic effects in fauna if concentrations and exposure are sufficiently high and long respectively. Narcotic effects of dissolved aromatic hydrocarbons are considered unlikely to occur from a spill of condensate of the size possible under operations. The dissolved aromatic hydrocarbons that tend to be toxic (e.g. monocyclic aromatic hydrocarbons such as BTEX chemicals) are also rapidly lost to the atmosphere through evaporation as they evaporate faster than they can dissolve in the water column due to their high volatility (French-McCay, 2002).

The intertidal and shoreline habitats at receptors within the EMBA and the sensitivities of these receptors to hydrocarbons are provided in Table 7-12. Further detailed information on the receptors can also be found in Appendix C.

7.6.2.1 Spill modelling results

Modelling results have been provided for each of the four hydrocarbon fates: shoreline accumulation; surface; dissolved and entrained.

Weathering characteristics of Reindeer condensate when released from the sea surface under variable wind conditions are shown in Figure 7-2.



Source: RPS (2024)

Figure 7-2: Mass balance plot representing the weathering of reindeer condensate spilled into the water column as a one-off release (50 m^3 over 1 hour) and subject to variable wind speeds of 2–23 knots (1–12 m/s) at 27 °C water temperature and 25 °C air temperature

These results show little oil mass predicted to persist on the sea surface after seven days (less than 1%) as a result of wind conditions. Variable wind speeds generate significant entrainment events For the variable wind speed case (Figure 7-2) where the winds are variable and of greater strength, after 24 hours, 88.9% of the condensate mass had evaporated and 7.9% is shown to have entrained, leaving only a small proportion floating on the water surface (~0.7%). The low volatile and residual components will tend to entrain beneath the surface under conditions that generate wind waves (> ~12 knots). Biological and photochemical degradation is predicted to contribute to the more gradual decay of the floating slick.

The modelling results are presented in for the fate of hydrocarbon at the exposure values defined in Section 7.5.5. Table 7-14 has been provided for the purposes of risk evaluation, displaying the following parameters:

- Minimum time to contact from moderate and high exposure value
- Maximum hydrocarbon concentration from high exposure value
- Maximum oil loading on shoreline from moderate and high exposure value
- Length of shoreline oiled.

Further parameters required to inform spill response strategies are described in the OPEP.

Floating oil

Low

Stochastic modelling determined that floating oil at concentrations equal to or greater than 1 g/m^2 could extend up to 6 km from the release site.

Moderate and high

No EVAs were predicted to be exposed to floating oil at, or above 1 g/m^2.

Shoreline accumulation

No shoreline accumulation is expected to occur for this scenario at, or above, the 10 g/m^2 threshold for any sensitive receptors.

Entrained oil

Low and Moderate

No entrained hydrocarbon exposure was predicted to occur at, or above, the 1,000 ppb threshold. No sensitive receptors are expected to be contacted at the 1,000 ppb threshold for entrained hydrocarbons.

Dissolved oil

Low

Stochastic modelling determined that dissolved hydrocarbons at concentrations of 10 ppb may occur up to 362 km from the spill site. The highest probability of dissolved oil exposure is 69% at the Montebello AMP. There is a 5.33% probability of exposure at Barrow-Montebello Surrounds and all other receptors have a probability of ≤1%.

Moderate

Stochastic modelling determined that dissolved hydrocarbons at concentrations of 50 ppb may occur up to 210 km from the spill site. There is a 2% probability of dissolved oil exposure at the Montebello AMP and a 0.33% probability for exposure at the Montebello AMP and 0.33% at Barrow-Montebello Surrounds. No other sensitive receptors are expected to be contacted at the moderate exposure value for dissolved hydrocarbons.

High

Stochastic modelling determined that no concentrations at, or above, the 400 ppb threshold were predicted. No sensitive receptors are expected to be contacted at the high exposure value for dissolved hydrocarbons.

Table 7-14: Modelling results for surface release of hydrocarbons from a LOWC at the WHP Platform

Receptor	Receptor Type	Minimum time to contact (hours)							Maximum Hydrocarbon Concentration							Maxim um accum	Maxim um
		Moderate exposure values				High exposure values			Moderate exposure values				High Exposure Values				
		Shoreline accumulation 100 g/m²	Surface hydrocarbons (10 g/m²)	Dissolved hydrocarbons (50 ppb)	Entrained hydrocarbon (1000 ppb)	Shoreline accumulation (1000 g/m²)	Surface hydrocarbons (50 g/m²)	Dissolved hydrocarbons (400 ppb)	Shoreline accumulation (100 gm²)	Surface hydrocarbons (10 g/m²)	Dissolved hydrocarbons (50 ppb)	Entrained hydrocarbon (1000 ppb)	Shoreline accumulation (1000 g/m²)	Surface hydrocarbons (50 g/m²)	Dissolved hydrocarbons (400 ppb)	Shoreline accumulation	Shoreline accumulation
Barrow-Montebello Surrounds	Submerged	NC	NC	598	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Montebello AMP	Submerged	NC	NC	55	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

E = exceeded the exposure value

C = contacted at the exposure value (timeframe and maximum concentration not specified in modelling)

NC = no contact

7.6.3 Environmental performance and control measures

Environmental performance outcome (EPO) relating to this event include:

- No loss of containment of hydrocarbon to the marine environment [EPO-RE-08].

Control measures applied to prevent an oil spill are shown in Table 7-15, and corresponding EPSs and measurement criteria are described in Table 8-2.

Selection of oil spill response strategies and associated EPOs, control measures and EPSs, including those required to maintain preparedness and for response, are detailed within the OPEP. The OPEP contains an evaluation of oil spill preparedness arrangements to demonstrate that oil spills will be mitigated to ALARP.

Table 7-15: Control measures evaluation for surface release of condensate from wellheads at the Reindeer WHP

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-05	Navigation lighting and aids	Engineering	Reduces risk of environmental impact from vessel collisions due to ensuring safety requirements are fulfilled and other marine users are aware of the presence of the WHP and vessels.	Costs of operating and maintaining navigational equipment.	Adopted – Benefits considered to outweigh costs.
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-14	Existing (gazetted) PSZ established around the WHP location.	Isolation	Petroleum safety zone applies around the Reindeer WHP and the WHP and DC supply pipeline is marked on Australian Nautical Charts. Reduces the potential for collisions with the platform resulting in a loss of well control.	No additional costs to Santos. Other marine users may be temporarily excluded from areas, disrupting their activities.	Adopted – Regulatory requirement must be adopted. Risk of excluding other marine users within a 500 m radius of the Reindeer WHP is unlikely to significantly impact upon the marine user. The benefits to safety of the activity (thus reducing risk of environmental impacts due to vessel collisions) outweighs potential costs.
RE-CM-15	Navigational charts	Administrative	Provides a means for other marine users to be aware of the presence of the platform and vessels.	Costs associated with personnel time in issuing notifications.	Adopted – Benefits considered to outweigh costs.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
RE-CM-40	Dropped object prevention procedures	Administrative	Impacts to the environment are reduced by preventing dropped objects. Requires lifting equipment is certified and inspected.	Costs associated with personnel time in implementing procedures and in incident reporting.	Adopted – Benefits considered to outweigh costs.
RE-CM-41	Inspection of platform structures and hydrocarbon-containing equipment.	Administrative	Regular inspections reduce the risk of leaks from platform structures and hydrocarbon-containing equipment by confirming appropriate integrity.	Costs associated with personnel time in performing the inspection and reporting of inspections and follow-up actions.	Adopted – Benefits considered to outweigh costs.
RE-CM-46	NOPSEMA-accepted WOMP for Reindeer wells	Administrative	Includes control measures for well integrity and well control, as well as ongoing inspection requirements.	Costs associated with personnel time in writing, reviewing, and implementing the WOMP.	Adopted – Benefits considered to outweigh costs. Regulatory requirement must be adopted.
RE-CM-47	Well services procedures and criteria.	Administrative	Includes control measures for well integrity, well operations and well control.	Costs associated with personnel time in writing, reviewing and implementing the procedures.	Adopted – Benefits considered to outweigh costs.
RE-CM-49	Inspection and corrosion monitoring.	Administrative	Regular inspections reduce the risk of leaks from DC supply pipeline and risers by confirming appropriate integrity.	Costs associated with personnel time in performing the inspections, monitoring and reporting of inspections and follow-up actions.	Adopted – Benefits considered to outweigh costs.
RE-CM-50	Testing and maintenance of emergency shutdown systems and shutdown/ safety valves.	Engineering	Maintenance and testing of emergency systems and shutdown valves enables potential spill volumes to be minimised.	Costs associated with personnel time in performing the testing and maintenance.	Adopted – Benefits considered to outweigh costs.
RE-CM-51	Accepted Oil pollution emergency plan (OPEP).	Administrative	Implements response plan to deal with an unplanned hydrocarbon spills quickly and efficiently in order to reduce impacts to the marine environment.	Personnel and administrative costs associated with preparing documents, ongoing management (spill response exercises) and implementation of OPEP.	Adopted – Benefits of ensuring procedures are followed and control measures implemented outweigh costs to Santos.
RE-CM-52	Support vessel positioning.	Engineering	Allows the vessel to maintain accurate positioning and reduce potential to impact the platform.	Costs associated with vessels requiring appropriate positioning systems; however, these are standard on certain classes of vessel.	Adopted – The benefits to safety and the environment (thus reducing risk of environmental impacts due to vessel collisions)

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
					outweigh potential costs.
RE-CM-53	Emergency power system is provided on Reindeer WHP to secure secondary power source for safety integrity system.	Engineering	Provides backup power for the offshore safety integrity system for control of emergency shutdowns in abnormal operational situations.	Costs associated with the personnel time in performing the testing and maintenance.	Adopted – Benefits of ensuring procedures are followed and control measures implemented outweigh costs to Santos.
RE-CM-54	Emergency response plan detailing the requirements for preparedness and response to emergencies and crises to protect people and the environment.	Administrative	Provides detail to ensure the ESD system quickly and efficiently if it has not automatically activated, to reduce the extent of impacts to the marine and terrestrial environment.	Administrative costs of preparing documents.	Adopted – Benefits considered to outweigh costs.
Additional Control Measures					
N/A	Standby vessel in situ 24 hours/day at WHP.	Administrative	Monitor the WHP 500 m-radius petroleum safety zone and be equipped with an automatic identification system to aid in its detection at sea, and radar to aid in the detection of approaching third-party vessels. Reduces risk of vessel collision and subsequent unplanned release of hydrocarbons causing potential harm to the marine environment.	High cost associated with contracting standby vessel. Costs of operating navigational equipment.	Rejected – The costs associated with having a vessel on location 24/7 are considered disproportionate to the environmental benefit gained, particularly given the WHP and infrastructure are marked on charts and navigational aids are present.
N/A	Source control plans in place for all wells.	Admininstrative	May allow for quicker response to a loss of well control scenario, therefore limiting potential spill extent and volume.	Costs associated with personnel time in writing and reviewing source control plans.	Rejected – Santos only has source control plans in place for wells undergoing intervention activities, and it is part of the intervention planning process. Given the low risk presented by wells and the standards used to manage well integrity it is not considered an effective control.
N/A	Additional remote visual monitoring	Administrative	Early detection of gas and leaks from	Gas detection already on the	Rejected -There is no environmental

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
	of the unmanned WHP for small leaks through closed circuit television (CCTV)		the wellhead platform.	platform, which provides reliable detection of hydrocarbons. Gas/Condensate would be difficult to visually see over CCTV. Some CCTV in situ but not positioned to specifically oversee leaks. In addition, CCTV is high maintenance with the lens prone to becoming dirty, and therefore the effectiveness for picking up leaks would be less reliable. More helicopter trips would be required to clean the lens and therefore resulting in an increase in safety risks for increased personnel transfers.	benefit over existing gas detectors on the platform and additional risk to personnel safety from increase in helicopter trips to maintain CCTV.
N/A	Add additional warnings and/or lights to attract attention	Engineering	Potential reduction in risk of collisions	As per RE-CM-05, vessels shall comply with Marine Order Part 30: Prevention of Collisions, and with Marine Order Part 21: Safety of Navigation and Emergency Procedures. Additional warnings and/or lighting would require retrofitting vessels, requiring additional financial and logistics costs, disproportionate to any environmental benefit.	**Rejected** – Cost is disproportionate to increase in environmental benefit.
N/A	Offshore guard vessel/s that can monitor traffic, and take early action to alert a vessel approaching the area of operations	Administrative	Potential reduction in risk of collisions	Significant extra costs associated with procuring a guard vessel, for negligible reduction in collision risk. An additional vessel may also introduce safety and environment risks.	**Rejected** – Cost is disproportionate to increase in environmental benefit.

7.6.4 Environmental impact assessment

The below environmental impact assessment follows the risk assessment approach detailed in Section 7.5.6.

7.6.4.1 Identification of hotspots for consequence analysis

As described in Section 7.5.6, all HEVs within the EMBA (low exposure value) are listed in Table 7-16. The values and sensitivities associated with these HEVs have been described in Appendix C. Further to this, Table 7-16 filters the HEV to identify the hotspots where they meet the criteria in Table 7-16, also described in Section 7.5.6.

Table 7-16: Identified high environmental value and hotspot receptors

Receptor	HEV Value	Exposure Value			Hotspot
		Low	Moderate	High	
Barrow Island	3	√			
Barrow-Montebello Surrounds	3	√	√		Yes
Glomar Shoals	5	√			Yes
Montebello AMP	3	√	√		Yes
Montebello Islands	3	√			
Muiron Islands	2	√			
Ningaloo – Offshore	2	√			
Ningaloo – Outer Coast North	1	√			
Ningaloo – Outer NW	3	√			
Ningaloo Coast North	1	√			
Penguin Bank	5	√			
Rankin Bank	5	√			
Rosily Shoals	4	√			
Southern Islands Coast	5	√			

This process identified the following hotspots and rationale for their selection are shown below:

Table 7-17: Determination and rationale for the hotspots

Hotspots	Type	HEV Ranking	Hotspot	Rationale
Barrow-Montebello Surrounds	Submerged	3	Yes	**Meets standard criteria:** HEV = 3 and Dissolved oil contacts at >5% probability for the low threshold (<1% probability at moderate exposure)
Montebello AMP	Submerged	3	Yes	**Meets standard criteria:** HEV = 3 and Dissolved oil contacts at >5% probability for the low threshold (<1% probability at moderate exposure)
Glomar Shoals	Submerged	5	Yes – Discretionary	**Discretionary**: Although an HEV of 5, dissolved oil contacts at >5% at low threshold with a maximum concentration on 48 ppb

Table 7-18 provides a simplified summary of the consequence assessment results for each of the Hotspot areas. The consequence assessment was based on predicted contact and concentration of floating oil, accumulated oil, entrained oil and dissolved aromatic hydrocarbons (DAHs). For each Hotspot area the consequence to the key values were assessed using the methodology described in Section 5.2.

Table 7-18: Hotspot consequence assessment results from worst case loss of well control surface release of Reindeer condensate

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Surface LOWC release	Consequence category	Worst-case consequence ranking	Total
Barrow-Montebello Surrounds (Intertidal)	3	Habitats • Coral reefs habitat Seabirds • Migratory birds Whales • Humpback/ pygmy blue whale migration Socio-economic • Significant for recreational fishing and charter boat tourism	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• II • II • II • II	II
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NA			
			Maximum accumulated oil on shoreline	(tonnes)	NC			
			Maximum accumulated concentration	(g/m^2)	NA			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	NA			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	59			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	598			
Montebello AMP (Submerged)	3	Habitats • Reefs – coral spawning: Mar and Oct • Algae (40%) • Mangroves (considered globally unique as they are offshore) • Fish habitat • Intertidal sand flat communities Turtles • Loggerhead and green (significant rookery), hawksbill, flatback turtles – Loggerhead turtle nesting: Dec–Jan; green turtle nesting: Nov–Apr,	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• III • III • III • III	III
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NA			
			Maximum accumulated oil on shoreline	(tonnes)	NC			
			Maximum accumulated concentration	(g/m^2)	NA			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	NA			

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Surface LOWC release	Consequence category	Worst-case consequence ranking	Total
		peak period from Jan–Feb; flatback turtle nesting: Dec–Jan; hawksbill turtle nesting: Oct–Jan • Northwest and Eastern Trimouille Islands (hawksbill) • Western Reef and Southern Bay at Northwest Island (green) Seabirds • Migratory and threatened seabirds – 14 species • Significant nesting (Sep–Feb), foraging and resting areas Whales • Humpback (Jun–Jul), pygmy blue (Apr–Aug) whale migration Socio-economic • Pearling (inactive/pearling zones) • Very significant for recreational fishing and charter boat tourism • Social amenities and other tourism Nominated place (national heritage)	Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	151			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	55			
Glomar Shoals	5	Birds • Wedge tail shearwater BIA Fish and sharks • Whale shark BIA KEF Glomar Shoals – high productivity and aggregations of marine life.	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• II • II • II • II	II
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NA			
			Maximum accumulated oil on shoreline	(tonnes)	NC			
			Maximum accumulated concentration	(g/m^2)	NA			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	NA			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			

Santos

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Surface LOWC release	Consequence category	Worst-case consequence ranking	Total
			Maximum concentration of dissolved hydrocarbons	(ppb)	48			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	NC			

Description – Surface Release of Condensate from the WHP	
Receptors	Threatened, migratory, or local fauna Protected areas Physical environment or habitats Socio-economic receptors
Consequence	III – Moderate

Threatened/Migratory and local fauna

A surface release of Reindeer condensate to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column with potential impacts from dissolved oil only at low or moderate thresholds. The potential pathways and impacts to shoreline receptors through hydrocarbon exposure and potential toxicity effects are summarised in Table 7-12. Marine fauna present in the area may be impacted by a spill through exposure to floating oil, entrained oil, or dissolved aromatic hydrocarbons.

Upon release to the marine environment, the condensate will rapidly lose toxicity with time and will spread thinner at the surface as evaporation continues or will become entrained within the water column. The potential sensitive receptors in the surrounding areas of the spill will include fish, marine mammals, marine reptiles and seabirds at the sea surface, as discussed Section 3.1.

Habitat modification, degradation, disruption or loss; deteriorating water quality; and marine pollution are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 3-10). In line with the relevant actions prescribed in Recovery Plan for Marine Turtles, conservation advice for fin, sei and whale shark, and conservation management plan for the blue whale, the activity will be conducted in a manner that reduces potential impacts to ALARP and acceptable levels.

In addition, the Management Plan for the Montebello/Barrow Islands Marine Conservation Reserves and the Montebello Marine Park states that Department of Parks and Wildlife (DPaW) should 'Ensure that important seabird and shorebird breeding and feeding areas are not significantly affected by human activities'. The potential impacts of a hydrocarbon release on seabird breeding and feeding areas are discussed in Table 7-12. Impacts in relation to human activities from responding to a spill are described in Section 6.7.

Physical environment or habitats

In the event of condensate release, hydrocarbons that reach nearshore environments have the potential to impact benthic coral reefs and mangrove areas, which may result in a long-term decrease in ecological values given the toxicity impacts associated with hydrocarbon exposure.

Protected areas

The EMBA intersects several protected areas and Australian marine parks and marine management areas (Section 3.2.5). Combined, these areas support all the habitats and faunal groups described above. Impacts to the habitat or fauna receptors described above therefore have an impact on the values of these reserves, which could have flow-on effects to tourism revenue of coastal communities that provide access to these marine reserves. Many of these receptors are values of protected areas, and there could be a major effect on them.

Socio-economic receptors

There is the potential for a spill to temporarily disrupt fishing activities if the surface or entrained oil moves through fishing areas.

A number of oil and gas operators operate within the EMBA with existing projects and infrastructure in place as well as continuing drilling and exploration programs. A condensate release has the potential to disrupt these activities, with associated economic impact, albeit on a temporary basis.

Tourism could be affected by spilled condensate, from reduced water quality preventing recreational activities or reducing aesthetic appeal or from impacts to habitats and marine fauna.

Indigenous users may be impacted in the event that a land-based response is required. However, consultation will help manage activities such that potential impacts are reduced to acceptable levels.

EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country.

On the basis of the above assessments, a condensate surface release from the platform from a loss of well control has the potential to impact an array of receptors. Given the extent, the worst-case consequence is considered to be III – Moderate.

Likelihood	A – Remote

The likelihood of a worst-case surface release at the Reindeer WHP resulting in a III – Moderate consequence is considered to be A – Remote. This is due to the number and type of controls in place and is also based on a review of industry and Santos' statistics.

As mentioned above the only activity where loss of well control is considered a credible scenario is during well intervention activities. The key well integrity risk associated with this activity is catastrophic failure of the primary and secondary barrier envelopes, compounded by additional failures in well integrity controls. To prevent this from occurring a number of engineering and operational barriers are in place and given the multiple and simultaneous catastrophic failure of verified barriers required for this event to occur, the likelihood is assessed as rare.

When considering the likelihood of a surface release of condensate from the WHP Santos has also assessed relevant industry statistics. A similar surface release of condensate from a WHP has never occurred within Santos operations and

Description – Surface Release of Condensate from the WHP	
Santos is not aware of an event of this type occurring within the Australian offshore well operations industry. Furthermore, the latest data reported in the September 2019 IOGP “Blowout Frequencies Report 434-02” report a blowout frequency of 9.0×10^{-6} for wire-line intervention operations in gas wells. These local and international statistics provide further justification that the likelihood of all barriers failing and resulting in surface release of condensate from the WHP is rare.	
Residual Risk	Very Low.

7.6.5 Demonstration of ALARP

Well intervention is required for the ongoing safe and efficient operation of the Reindeer production wells and is a standard industry activity. Removing well intervention and other well maintenance activities is therefore not considered a practicable option.

The Reindeer Well Operations Management Plan (WOMP) (DR-91-ZG-10038) identifies direct intervention, top-kill and relief well drilling as contingency strategies to respond to a loss of well control at Reindeer Platform wells. The primary means of controlling a well that cannot be brought under control using onsite resources is the drilling of a relief well to intercept the well bore and kill the flow of hydrocarbons.

Spill response and impact assessment for this activity has been based on the well self killing after ~70 days.

Supporting controls to allow the relief well schedule to be met include:

- Rig capability register to identify suitable rigs. Identification of suitable rigs is also included in the terms of reference for “Assurance Review 4: Readiness to Spud” under the WLMS Well Delivery Workflow
- Source Control Emergency Response Plan (SCERP) (DR-00-ZF-10001) (details relief well planning matters, including but not limited to relief well design and procurement matters)
- Preliminary relief well planning prior to well interventions is embedded into the well delivery workflow
- APPEA Memorandum of Understanding (MoU) provides for access to other Operator rigs
- Contracts and MoUs for personnel are in place.

The immediate response to a release of hydrocarbon from the WHP is via the emergency shutdown system managed through the Devil Creek Emergency Response Plan (DC-40-IF-00096) which also covers the Reindeer facilities. This system responds to both automatic and manual activation, with automatic activation triggered by abnormal process conditions, such as pressure drop across the subsea production system. Gas detectors are also in place on the WHP to identify anomalies and instigate ESD. The emergency shutdown system functionality and reliability are maintained through regular testing of the shutdown systems and the subsea valves. The regular testing and maintenance of the emergency shutdown and blowdown systems are managed through Performance Standard Assurance Plans (PSAPs), which provide the work instructions and performance criteria to test and service the shutdown and blowdown systems against. The relevant PSAPs contain specific performance criteria as detailed below:

- PS-06 ESD and Blowdown: Emergency Shutdown Valves (ESDVs) (RE-00-RG-00047). The performance criteria specified in PS-06 includes:
  - Appropriate ESDV location, ESDV fail closed criteria, ESDV fail close on demand timings, process safety time calculation, acceptable leak rates of the ESDV (as per American Petroleum Institute), ESDV signage, ESDV position discrepancy alarm requirements, timing requirements of hydraulic shutdown valves for fail safe operation.
- PS-08 ESD and Blowdown: Safety Instrumented Systems (RE-00-RG-00049). The performance criteria for Safety instrumented Systems in PS-08 includes:
  - Requirements of SIS to initiate shutdown and blowdown via logic solvers, isolation of electrical equipment, ESD pushbuttons available for manual activation location on platform, status of Safety Instrumented System (SIS) elements display requirements, reliability/availability achievement and testing requirements, and requirements for Probability of Failure on Demand of the system.
- PS-10 ESD and Blowdown: Pressure Safety Valves (RE-00-RG-00050). The performance criteria specified in PS-10 includes:
  - Relief system designed and operated in accordance with American Petroleum Institute requirements, set PSV relief pressure specifications, PSV reliability /availability function testing and examinations, critical manual valve position requirements.

The relevant PSAPs are listed as control measures with relevant performance standards in Table 8-2. These performance standards are not applicable once the hydrocarbon has been removed/flushed from the pipeline.

The maintenance and regular testing of the shutdown systems and the subsea valves managed through the PSAPs ensures available, reliable, survivable and independent control ensuring the emergency shutdown and blowdown functionality, resulting in near-instantaneous shut in following loss of pressure, and is considered to reduce the spill volume to ALARP for an unplanned release of condensate from the production wells at Reindeer WHP.

No additional controls can be considered that reduce the likelihood of a well blowout further in terms of equipment and practices, given that industry standards are adhered to in terms of well design (i.e. provision of subsea safety valves), well equipment certification, well integrity testing and the trained and competent personnel. These practices are stipulated within the Reindeer WHP WOMP, which has regulatory approval. It is therefore considered that the risk of a loss of containment occurring has been reduced to ALARP.

Santos considers that through the resourcing arrangements outlined within the OPEP (including spill response equipment and personnel from internal and external sources including Santos, AMOSC, AMSA, other operators, OSRL, and other national and international suppliers) the spill response strategies and control measures reduce potential risk and impacts from to ALARP.

In terms of further reducing the risk of a vessel collision to the WHP, there are no practicable alternatives that would not provide a disproportionate environmental benefit given the low likelihood of a collision for a vessel of sufficient size to lead to a catastrophic platform collision. The Reindeer WHP Safety Case considers that the only vessels capable of catastrophic platform damage are large support vessels (e.g. a diving support vessel under power but not a typical support vessel, which are smaller vessels; i.e. typically less than 75 tonne displacement). The use of large diving support style vessels cannot be eliminated as they are necessary for the maintenance of subsea infrastructure that reduces environmental risk from hydrocarbon releases. The risk of an errant powered vessel (e.g. a ship) colliding with the platform cannot be completely eliminated but is a low risk given there are no nearby shipping channels.

The controls in place for preventing vessel impact are consistent with those provided in the Reindeer WHP Safety Case and are considered to reduce risk to ALARP. The WHP is an unmanned platform, and while the manning of the platform or a permanently stationed support vessel as a means of communicating with collision threats could be considered, the cost and effort of these measures are grossly disproportionate to their possible benefit and carry other environmental and safety risks. Unmanned navigation hazards (but which are marked on nautical charts) are commonplace on the NWS, and the likelihood of collision with the Reindeer WHP is no more likely than with these other hazards.

The combination of the standard prevention control measures (Section 7.6.3) (which reduce the likelihood of the event happening) and the spill response strategies (which may reduce the consequence) together reduce the overall hydrocarbon spill risk.

In terms of spill response activities, Santos will implement oil spill response as specified within the OPEP. A detailed ALARP assessment on the adequacy of arrangements available to support spill response strategies and control measures is presented in the OPEP.

The ongoing general inspection and maintenance regime that is completed in accordance with the NOPSEMA-accepted WOMP and Santos procedures, ensures that property is maintained in good condition and repair until the point in time when the property is removed from the title.

It is through the development and eventual implementation of the Decommissioning Plan that Santos will meet its obligations under s. 572 (3) of the OPGGS Act ‘to 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’.

7.6.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum credible spill scenario from the Reindeer WHP is ranked as *Very Low*.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos’ Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – management consistent with OPGGS Regulations, including safety case and WOMP. Santos has considered the values and sensitivities of the receiving environment, including but not limited to:

	• Conservation values of the identified protection priorities including a number of Australian Marine Parks. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised. DoT has been consulted during the development of the OPEP and strategic net environmental benefit analysis and raised no concerns.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The likelihood of a loss of well control event is Rare when considering industry statistics, Santos statistics and the preventive controls in place. Additional industry standards and activity-specific control measures to reduce the chance of a loss of well control event (and minimise impacts) have also been implemented, including (but not limited to) procedures such as the WOMP, safety case, personnel training and awareness, and a spill response plan (the OPEP). In accordance with Santos' risk assessment process, the residual risk is considered to be Very Low and ALARP.

The proposed control measures will reduce the risk of impacts from a loss of well control event to a level that is considered acceptable.

7.7 Subsea release of condensate from DC supply pipeline

7.7.1 Description of event

Event	It is considered credible that an unplanned release of condensate could occur from the subsea DC supply pipeline during operations, IMMR and CoP activities. The potential hazard sources that could cause an unplanned release of condensate from the DC supply pipeline include: • Internal/external corrosion • Anchor impact dragging • Loss of suspended load from a visiting vessel This maximum credible spill would result in a subsea pipeline leak of 121.4 m^3 of Reindeer condensate over 3.75 hours. This is to represent late life operations scenarios; this can be taken as the maximum condensate volume contained within the DC supply pipeline between isolation points at the WHP and the DCGP, plus the condensate contained within an hour of flow. Suspension phase operations have neglected condensate in-flow given the DC supply pipeline is assumed to be shut-in. There are no events identified that could result in a pin hole leak in the DC supply pipeline less than the low-pressure alarm trigger (6000 kPa), other than a cyclone. For the purpose of this section 'the spill scenario' refers to the maximum credible spill from the DC supply pipeline in the event of a full pipeline rupture, unless otherwise stated.
Extent	The subsea release from the DC supply pipeline spill scenario is credible anywhere along the DC supply pipeline in Commonwealth waters. Predictive oil spill modelling for a subsea release from the DC supply pipeline of 121.4 m^3 of Reindeer condensate at the State waters boundary has been modelled as this is the location closest to sensitive receptors. Concentrations at the sea surface above the exposure value of 1 g/m^2 are predicted to extend for 8 km from the release site, with no contact to sensitive receptors at, or above this exposure value. No shoreline accumulation was observed for this scenario at, or above, the 10 g/m^2 threshold. Entrained oil in the water column above the biological exposure value of 1000 ppb is predicted to occur within a region up to 9 km, with no predicted contact at, or above this exposure value. Dissolved aromatic hydrocarbons in the water column above the low exposure value of 10 ppb are predicted to occur up to 127 km from the release site, with possible contact predicted at (Barrow-Montebello Surrounds, Dampier AMP, Dampier Archipelago, Madeleine Shoals and Montebello AMP). A slow release from the DC supply pipeline below the low-pressure alarm trigger is credible post cyclone. Post a significant cyclone event, the entire DC supply pipeline may be inspected in accordance with the Subsea Inspection Procedure (SO-35-IS-00001). The rate and volume of this type of leak would be orders of magnitude lower than the maximum credible spill from the DC supply pipeline scenario assessed in this EP and therefore the extent of this scenario is considered to be within the extent assessed for the maximum credible spill from a subsea pipeline and has not been individually modelled.
Duration	3.75 hours.

7.7.2 Nature and scale of Impacts

Hydrocarbon spills will cause a decline in water quality and may cause chemical (e.g. toxic) and physical (e.g. coating of emergent habitats, oiling of wildlife at sea surface) impacts to marine species. The severity of the impact of a hydrocarbon spill depends on the magnitude of the spill (i.e. extent, duration) and sensitivity of the receptor.

Potential receptors: Shallow benthic, intertidal and shoreline habitats; plankton; invertebrates; fish; marine mammals; marine reptiles; birds (seabirds and shorebirds); fisheries' oil and gas industry; tourism; KEFs; and marine reserves.

A subsea release of condensate from the DC supply pipeline to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column near the location of the spill. The subsea release of condensate from the DC supply pipeline may result in dissolved condensate contacting shorelines at low concentrations. Potential impact pathways (physical and chemical) of hydrocarbon exposure for receptors are summarised in Table 7-12 and potential impacts to receptors found within the EMBA are further described in Section 7.6.4..

7.7.2.1 Spill modelling results

Modelling results have been provided for each of the four hydrocarbon fates: shoreline accumulation; surface; dissolved and entrained.

Weathering characteristics of Reindeer condensate are shown in Section 7.6.2.1.

The modelling results are presented in for the fate of hydrocarbon at the exposure values defined in Section 7.5.5. Table 7-19 has been provided for the purposes of risk evaluation, displaying the following parameters:

- Minimum time to contact from moderate and high exposure value
- Maximum hydrocarbon concentration from high exposure value
- Maximum oil loading on shoreline from moderate and high exposure value
- Length of shoreline oiled.

Further parameters required to inform spill response strategies are described further in the OPEP.

Floating oil

Low

Stochastic modelling determined that floating oil is expected to remain localised around the spill location, with floating oil at the low exposure value being expected up to 8 km from the spill site at concentrations of 1 g/m^2. No EVAs are expected to be contacted at the low exposure value for floating hydrocarbons.

Moderate

Stochastic modelling determined that there will be no dispersal of floating oil at the moderate exposure value of 10 g/m^2 from the spill site. No EVAs are expected to be contacted at the moderate exposure value for floating hydrocarbons.

High

Stochastic modelling determined that there will be no dispersal of floating oil at the high exposure value of 50 g/m^2 from the spill site. No EVAs are expected to be contacted at the high exposure value for floating hydrocarbons.

Shoreline accumulation

No shoreline accumulation is predicted for this scenario at, or above, the 10 g/m^2 threshold. Therefore, no EVAs are expected to experience shoreline accumulation of hydrocarbons, at all exposure values.

Dissolved oil

Low

Stochastic modelling determined that dissolved oil at the low exposure value of 10 ppb is expected to reach up to 127 km from the spill site. The maximum probability of contact is at the Dampier AMP at 1%. All other receptors have predicted contact <1%.

Moderate

Stochastic modelling determined that dissolved oil at the moderate exposure value of 50 ppb may reach up to 82 km from the spill site. Several receptors have predicted contact <1% including: Dampier AMP, Madeleine Shoals and Montebello AMP. All other receptors have no predicted contact at the moderate exposure value for dissolved hydrocarbons.

High

Stochastic modelling determined that dissolved oil at the high exposure value of 400 ppb may reach up to 27 km from the spill site. No EVAs are expected to be contacted at the high exposure value for dissolved hydrocarbons.

Entrained oil

Low/Moderate

Stochastic modelling determined that entrained oil at the low/moderate exposure value of 1,000 ppb may reach up to 9 km from the spill site. No EVAs are expected to be contacted at the 1,000 ppb threshold for entrained hydrocarbons.

Shoreline accumulation

No shoreline accumulation is predicted for this scenario at, or above, the 10 g/m^2 threshold. Therefore, no sensitive receptors are expected to experience shoreline accumulation of hydrocarbons, at all exposure values.

Table 7-19: Modelling results for subsurface release of hydrocarbons from the DC supply pipeline

Receptor	Receptor Type	Minimum time to contact (hours)							Maximum Hydrocarbon Concentration							Maximum accum	Maximum length
		Moderate exposure values				High exposure values			Moderate exposure values				High Exposure Values				
		Shoreline accumulation 100 g/m^2	Surface hydrocarbons (10 g/m^2)	Dissolved hydrocarbons (50 ppb)	Entrained hydrocarbon (1000 ppb)	Shoreline accumulation (1000 g/m^2)	Surface hydrocarbons (50 g/m^2)	Dissolved hydrocarbons (400 ppb)	Shoreline accumulation (100 gm^2)	Surface hydrocarbons (10 g/m^2)	Dissolved hydrocarbons (50 ppb)	Entrained hydrocarbon (1000 ppb)	Shoreline accumulation (1000 g/m^2)	Surface hydrocarbons (50 g/m^2)	Dissolved hydrocarbons (400 ppb)	Shoreline accumulation	Shoreline accumulation
Barrow-Montebello Surrounds	Submergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	11	NC	NC	NC	NC	NC	NC
Dampier AMP	Submerged	NC	NC	192	NC	NC	NC	NC	NC	NC	62	NC	NC	NC	NC	NC	NC
Dampier Archipelago	Emergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	26	NC	NC	NC	NC	NC	NC
Madeleine Shoals	Submerged	NC	NC	182	NC	NC	NC	NC	NC	NC	65	NC	NC	NC	NC	NC	NC
Montebello AMP	Submergent	NC	NC	198	NC	NC	NC	NC	NC	NC	79	NC	NC	NC	NC	NC	NC

NC = no contact

7.7.3 Environmental performance and control measures

Environmental performance outcome (EPO) relating to this event include:

- No loss of containment of hydrocarbon to the marine environment [EPO-RE-08].

Control measures applied to prevent an oil spill are shown in Table 7-20, and corresponding EPSs and measurement criteria for the EPOs described in Table 8-2.

Selection of oil spill response strategies and associated EPOs, control measures and EPSs, including those required to maintain preparedness and for response, are detailed within the OPEP. The OPEP contains an evaluation of oil spill preparedness arrangements to demonstrate that oil spills will be mitigated to ALARP.

Table 7-20: Control measures evaluation for subsea release of condensate from DC supply pipeline

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-48	NOPSEMA-accepted safety case.	Administrative	Includes control measures for pipeline integrity and management controls.	Costs associated with personnel time in writing, reviewing and implementing the safety case.	Adopted – Benefits considered to outweigh costs. Regulatory requirement must be adopted.
RE-CM-49	Inspection and corrosion monitoring.	Administrative	Regular inspections reduce the risk of leaks from DC supply pipeline by confirming appropriate integrity.	Costs associated with personnel time in performing the inspections, monitoring and reporting of inspections and follow-up actions.	Adopted – Benefits considered to outweigh costs.
RE-CM-50	Testing and maintenance of emergency shutdown systems and shutdown/safety valves.		Maintenance and testing of emergency systems and shutdown valves enable potential spill volumes to be minimised.	Costs associated with personnel time in performing the testing and maintenance.	Adopted – Benefits considered to outweigh costs.
RE-CM-15	Navigational charts	Administrative	Provides a means for marine users to be aware of the presence of the platform and subsea infrastructure.	Costs associated with personnel time in issuing notifications.	Adopted – Benefits considered to outweigh costs.
RE-CM-40	Dropped object prevention procedures.	Administrative	Impacts to environment are reduced by preventing dropped objects. Minimises drop risk during lifting operations. Requires lifting equipment to be	Costs associated with personnel time in implementing procedures and in incident reporting.	Adopted – Benefits considered to outweigh costs.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			certified and inspected.		
RE-CM-53	Emergency power equipment is provided on Reindeer WHP to provide secondary power source for safety integrity system.		Provides backup power for the offshore safety integrity system for control of emergency shutdowns in abnormal operational situations.	Costs associated with the personnel time in performing the testing and maintenance.	Adopted – Benefits of ensuring procedures are followed and control measures implemented outweigh costs.
RE-CM-51	Accepted oil pollution emergency plan (OPEP).		Implements response plan to deal with an unplanned hydrocarbon release quickly and efficiently in order to reduce impacts to the marine environment.	Administrative costs associated with preparing documents, ongoing management (spill response exercises) and implementation of OPEP.	Adopted – Benefits of ensuring procedures are followed and measures implemented and that the vessels are compliant outweighs the costs. Regulatory requirement must be adopted.
RE-CM-54	Emergency response plan detailing the requirements for preparedness and response to emergencies and crises to protect people and the environment.	Administrative	Provides detail to ensure the ESD system quickly and efficiently if it has not automatically activated, to reduce the extent of impacts to the marine and terrestrial environment.	Administrative costs of preparing documents.	Adopted – Benefits considered to outweigh costs.
RE-CM-13	Anchoring and equipment deployment management.		Anchoring and placement of equipment is controlled through ensuring that any anchoring occurs at pre-approved locations, thereby reducing potential environmental impacts.	Costs associated with implementing procedures.	Adopted – Benefits considered to outweigh costs.
Additional Control Measures					
N/A	Flyover inspection of DC supply pipeline during helicopter transfers.		Identification of bubbles at the sea surface may indicate a potential leak from the DC supply pipeline that would be further investigated and therefore limit the potential volume of a spill event.	Costs associated with helicopter and training of crew to observe.	Rejected – A safe distance above sea level needs to be maintained by the helicopter. To observe any bubbles at the sea surface, weather conditions and sea state would need to be flat

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
					calm. Based on these limitations, this is not considered an effective stand-alone control.

7.7.4 Environmental impact assessment

The below environmental impact assessment follows the risk assessment approach detailed in Section 7.5.6.

7.7.4.1 Identification of hotspots for consequence analysis

As described in Section 7.5.6 all HEVs within the EMBA (low exposure value) are listed in Table 7-21. The values and sensitivities associated with these HEVs have been described in Section 2.11. Further to this, Table 7-21 filters the HEVs to identify the hotspots where they meet the criteria in Section 7.5.6. This assessment has found that there are no hotspots that trigger further assessment in this section of the EP as all contact at any threshold is <1%.

Table 7-21: Identified high environmental value and hotspot receptors

Receptor	HEV Value	Exposure Value			Hotspot
		Low	Moderate	High*	
Dampier Archipelago	3	✓			
Barrow-Montebello Surrounds	3	✓			
Dampier AMP	4	✓	✓		
Madeleine Shoals	4	✓	✓		
Montebello AMP	3	✓	✓		

Description – Subsea Release of Condensate from DC supply pipeline	
Receptors	Threatened, migratory, or local fauna Protected areas Physical environment or habitats Socio-economic receptors
Consequence	II – Minor

Marine fauna

In the event of a pipeline release, the volume of hydrocarbons released would be the entire volume within the DC supply pipeline between isolation points, that is 121.4 m^3 condensate based on the full DC supply pipeline inventory during late life operations. Given the nature of condensate (light hydrocarbon) and dilution and dispersion from natural weathering processes (such as ocean currents), the extent of exposure will be limited in area and duration.

The susceptibility of marine fauna to hydrocarbons depends on hydrocarbon type and exposure duration; however, given that exposures would be limited in extent and duration, exposure to marine fauna from this hazard is not expected to result in a fatality. Potential impacts to marine fauna from a larger condensate release are described in detail in Section 7.6.4.

Habitat modification, degradation, disruption or loss, deteriorating water quality, and marine pollution are identified as potential threats to a number of marine fauna species in relevant recovery plans and conservation advice (Table 3-10). With controls in place that are in accord with relevant actions described in various recovery plans, the activity will be conducted in a manner that reduces potential impacts to ALARP and of acceptable level.

In the unlikely event that a DC supply pipeline rupture did occur and resulted in a condensate release from the DC supply pipeline, the potential impacts to the environment would be greatest within several kilometres from the release location, when the toxic aromatic components of the fuel would be at their highest concentration. Condensate will rapidly lose toxicity with time and will spread thinner as evaporation continues. The potential sensitive receptors in the areas surrounding the spill will include those in the water column, such as fish, marine mammals, marine reptiles and submerged habitats. Receptors at the sea surface and on shorelines may also be impacted from a DC supply pipeline rupture. Hydrocarbons that reach nearshore environments have the potential to impact benthic coral reefs and mangrove areas, which may result in a long-term decrease in ecological values given toxicity impacts associated with hydrocarbon exposure. Potential impacts to these receptors from a larger condensate release are described in detail in Section 7.6.4.

Description – Subsea Release of Condensate from DC supply pipeline	
Protected areas Impacts to the habitat and fauna receptors described above have an impact on the values of Australian marine parks and marine management areas, which could have flow-on effects to tourism revenue of coastal communities that provide access to these marine reserves. Many of these receptors are values of protected areas, and there could be a major effect on them. Potential impacts to these receptors from a larger condensate release are described in detail in Section 7.5.6.5. Physical environment or habitats In the event of condensate release, hydrocarbons that reach nearshore environments have the potential to impact benthic coral reefs and mangrove areas, which may result in a long-term decrease in ecological values given the toxicity impacts associated with hydrocarbon exposure. Socio-economic receptors There is the potential for entrained oil to temporarily disrupt fishing activities if the surface or entrained oil moves through fishing areas. Potential impacts to these receptors from a larger condensate release are described in detail in Section 7.5.6.5. Tourism could be affected by spilled condensate, either from reduced water quality or shoreline oiling preventing recreational activities or reducing aesthetic appeal or from impacts to habitats and marine fauna. Potential impacts to these receptors from a larger condensate release are described in detail in Section 7.5.6.5. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. On the basis of the above assessments, a condensate release from a DC supply pipeline rupture has the potential to impact receptors in the water column. Given the extent, the worst-case consequence is considered to be II – *Minor*.	
Likelihood	A – Remote
A hydrocarbon release resulting from a DC supply pipeline rupture caused by an integrity or corrosion issue, dropped object or anchor drag is unlikely to have widespread ecological effects, given the nature of the condensate, controls in place, the safety design of the production system, the limited volumes that could be released, the water depth and the transient nature of marine fauna in this area. Deteriorating water quality is identified as a potential threat to turtles in the marine turtle recovery plan and to some bird and shark species (Table 3-10). Habitat modification, degradation, disruption, and loss are also identified as threats to sharks, birds, cetaceans and turtles in conservation management and recovery plans. However, the potential hydrocarbon releases as a result of DC supply pipeline rupture are not expected to significantly impact the receiving environment, given the management controls proposed. Additionally, long-term impacts resulting in complete habitat loss or degradation are not considered likely, given the controls proposed to prevent releases; therefore, the activity will be conducted in a manner that is considered acceptable. The likelihood of a hydrocarbon release occurring due to DC supply pipeline rupture is limited by the set of mitigation and management controls in place. Consequently, the likelihood of a DC supply pipeline rupture releasing hydrocarbons to the environment which results in a minor consequence is considered to be A – *Remote*.	
Residual Risk	*Very Low.*

7.7.5 Demonstration of ALARP

It is considered that there are no additional reasonably practicable risk reduction measures, further to those described in Section 7.7.3, that would provide benefit to the environment as detailed below.

Since the transfer of condensate to DCGP processing facilities is an integral part of activities, the risk of a condensate spill from the DC supply pipeline cannot be completely eliminated along the length of the DC supply pipeline even during late life operations when the DC supply pipeline is shut in.

The identified causes of DC supply pipeline rupture from external factors are through a loss of integrity, corrosion, dropped objects and anchor drag. A number of procedural controls are in place that reduce the likelihood of these events. Eliminating the potential from dropped objects and anchoring is not feasible since vessel activity is also inherent in the activities (e.g. inspection and maintenance activities using ROVs and divers), and equipment and materials are required to be loaded onto Reindeer WHP.

The subsea DC supply pipeline is designed to reduce the potential for rupture and release of condensate to the marine environment. The integrity of the subsea production system is maintained through planned inspection, monitoring and testing of its components, ensuring that the system operates within its design requirements and that there is no unacceptable degradation of the system (e.g. materials, or ESD valve shutdown time or leakage).

The primary mechanism to immediately respond to a release of hydrocarbon from the subsea is via the emergency shutdown system managed through the Devil Creek Emergency Response Plan (DC-40-IF-00096) which also covers the Reindeer facilities. This system responds to both automatic and manual activation, with automatic activation triggered by abnormal process conditions, such as pressure drop across the subsea production system. The emergency shutdown system functionality and reliability are maintained through regular testing of the shutdown systems and the subsea valves. The regular testing and maintenance of the emergency shutdown and blowdown systems are managed through Performance Standard Assurance Plans (PSAPs), which provide the work instructions and performance criteria to test and service the shutdown and blowdown systems against. The relevant PSAPs contain specific performance criteria as detailed below:

- PS-06 ESD and Blowdown: Emergency Shutdown Valves (ESDVs) (RE-00-RG-00047). The performance criteria specified in PS-06 includes:
  - Appropriate ESDV location, ESDV fail closed criteria, ESDV fail close on demand timings, process safety time calculation, acceptable leak rates of the ESDV (as per American Petroleum Institute), ESDV signage, ESDV position discrepancy alarm requirements, timing requirements of hydraulic shutdown valves for fail safe operation.
- PS-08 ESD and Blowdown: Safety Instrumented Systems (RE-00-RG-00049). The performance criteria for Safety instrumented Systems in PS-08 includes:
  - Requirements of SIS to initiate shutdown and blowdown via logic solvers, isolation of electrical equipment, ESD pushbuttons available for manual activation location on platform, status of Safety Instrumented System (SIS) elements display requirements, reliability/availability achievement and testing requirements, and requirements for Probability of Failure on Demand of the system.
- PS-10 ESD and Blowdown: Pressure Safety Valves (RE-00-RG-00050). The performance criteria specified in PS-10 includes:
  - Relief system designed and operated in accordance with American Petroleum Institute requirements, set PSV relief pressure specifications, PSV reliability /availability function testing and examinations, critical manual valve position requirements.

The relevant PSAPs are listed as control measures with relevant performance standards in Table 8-2. These performance standards are not applicable once the hydrocarbon has been removed/flushed from the pipeline.

The maintenance and regular testing of the shutdown systems and the subsea valves managed through the PSAPs ensures available, reliable, survivable and independent control ensuring the emergency shutdown and blowdown functionality, resulting in near-instantaneous shut in following loss of pressure, and is considered to reduce the spill volume to ALARP for an unplanned release of condensate from the DC supply pipeline.

An automatic low-pressure alarm trip on the production header and each of the well flowlines is also triggered at 6000 kPa.

There are no current material environmental impacts or risks associated with the Reindeer-1 well. According to the NOPSEMA-accepted WOMP, all well integrity risks are ALARP.

In terms of spill response activities, Santos will implement oil spill response as specified in the OPEP. A detailed ALARP assessment on the adequacy of arrangements available to support spill response strategies and control measures is presented in the OPEP.

7.7.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum credible spill volume from the DC supply pipeline (max. 121.4 m^3) residual risk is ranked as *Very Low*.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with OPGGS Regulations including Safety Case and OPEP. Santos has considered the values and sensitivities of the receiving environment including, but not limited to: • Conservation values of the identified protection priorities including a number of Australian Marine Park. Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy

Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The likelihood of a subsea condensate release from the DC supply pipeline is Rare when considering industry statistics, Santos statistics and the preventive controls in place. Additional industry standard and activity-specific control measures to reduce the chance of the event occurring (and minimise impacts) have also been implemented, including (but not limited to) procedures such as the safety case, OPEP, personnel training and awareness, and a spill response plan (the OPEP).

In accordance with Santos WA's risk assessment process, the residual risk is considered to be Very Low and ALARP. The proposed control measures will reduce the risk of impacts from a subsea DC supply pipeline condensate release to a level that is considered acceptable.

7.8 Surface release of diesel

7.8.1 Description of event

Event	Worst credible marine diesel oil spill The maximum release of diesel would occur from a vessel collision scenario, either vessel to vessel or vessel to WHP. Vessel collisions could occur due to factors such as human error, poor navigation, vessel equipment failure or poor weather. This scenario would result in a spill of diesel at the sea surface. A maximum credible spill volume has been determined based on technical guidance provided by AMSA (2015). This guidance states that for a vessel other than an oil tanker, the maximum credible spill from a collision can be determined from the volume of the largest single fuel tank. In reviewing the fuel tank capacities of the, the largest single MDO bunker tank capacity identified as 325 m^3. Refuelling incident The second most significant MDO spill scenario identified is a primary vessel refuelling incident (fuel hose failure or rupture, coupling failure or tank overfilling) where fuel bunkering would need to be stopped manually. Fuel released prior to the cessation of pumping as well as fuel remaining in the transfer line may escape to the environment. The AMSA (2015) Technical Guidelines for Preparing Contingency Plans for Marine and Coastal Facilities provides guidance for calculating a maximum credible spill volume for a refuelling spill. The guidance provided by AMSA (2015) for a refuelling spill under continuous supervision is considered appropriate, given refuelling will be constantly supervised. The maximum credible spill volume during refuelling is calculated as: transfer rate (150 m^3/hr) × 15 minutes of flow giving a volume of 37.5 m^3. The detection time of 15 minutes is seen as conservative but applicable following failure of multiple barriers followed by manual detection and isolation of the fuel supply. For the purpose of this risk assessment the worst case marine diesel discharge of 325 m^3 was used.
Extent	A surface release (325 m^3) of diesel represents a worst-case spill from a vessel collision and this was modelled in two locations, at the WHP and at the Commonwealth-State waters boundary (with the Commonwealth-State waters boundary representing the worst-case location where this scenario could occur). The following paragraphs explain the results of the vessel to vessel collision at the Commonwealth-State waters boundary as this represents the worst-case location. Based on modelling, the surface slick is predicted to spread out rapidly to form a thin film on the sea surface, and a large proportion of it (30%) is predicted to evaporate under variable weather conditions within 24 hours of release. Over time, the diesel will become increasingly subject to entrainment into the water column as the density increases after losing the lighter components through evaporation. The rate of entrainment will be influenced by sea conditions (wind and wave action) at the time of the spill. Concentrations of floating oil at, or above, 1 g/m^2 could extend up to 36 km from the release location, with the distances reducing to 25 km and 12 km as the thresholds increase to 10 g/m^2 and 50 g/m^2, respectively. No shoreline oil accumulation was predicted at, or above, 1,000 g/m^2 threshold. The highest probability of oil accumulation was forecasted for Montebello Islands (9.33%) at, or above, 10 g/m^2. Dampier Archipelago registered the maximum volume of 24 m^3, as well as the shortest time before oil accumulation at 56 hours. Entrained oil concentrations greater than 1000 ppb extend up to 36 km from the release location. Entrained hydrocarbon contact greater than 1000 ppb is not predicted to occur at any receptors. Concentrations exceeding 10 ppb may potentially occur 125 km from the spill site with the distance reducing to 53 km as the threshold increased to 50 ppb. No concentrations at, or above, the 400 ppb threshold were predicted. Barrow-Montebello Surrounds, Lowendal Islands and Montebello Islands all recorded the highest probability of exposure of 0.67% at, or above, 10 ppb threshold. Montebello AMP registered the shortest time before exposure at 19 hours for the same threshold and demonstrated the highest concentration at 30 ppb.
Duration	1 hour

7.8.2 Nature and scale of impacts

Potential receptors: Plankton (including zooplankton and fish and coral larvae), Marine mammals, Marine reptiles, Seabirds and shorebirds, Shallow benthic, intertidal and shoreline habitats, Fish and sharks, Fisheries, Tourism, Protected areas, Shipping, Defence, Shipwrecks, Indigenous, Existing oil and gas activity and KEFs

A surface release of diesel to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column near the location of the spill. Based on modelling results, shoreline accumulation greater than 1000 g/m^2 was not predicted, though shoreline accumulation at or above 10g/m^2 was predicted at Montebello Islands. To account for a diesel release that may occur anywhere within Commonwealth waters and closer to sensitive receptors, potential impact pathways (physical and chemical) of hydrocarbon exposure for receptors are summarised in and potential impacts to receptors found within the EMBA are further described in Table 7-12.

Table 7-13 summarises the potential impacts of hydrocarbon spills to sensitive receptors and values within the EMBA.

7.8.2.1 Spill modelling results

Modelling results have been provided for each of the four hydrocarbon fates: shoreline accumulation; surface; dissolved and entrained.

The Reindeer WHP is the location with the greatest risk of a diesel spill since this is the most frequented part of the operational area in terms of vessel activity. Support vessels undertake routine personnel and equipment transfer trips to the platform on a monthly basis on average. A surface spill of 325 m^3 over 1 hour was modelled by RPS (2024). The release was modelled at two locations: at the Reindeer WHP and at the location where the pipeline intersects the Commonwealth–State waters boundary; the latter represents the worst-case location where a vessel spill could occur as a result of the activities covered in this EP (i.e. closest to shallow or shoreline habitats) and is therefore discussed in greater detail. A hydrocarbon release during bunkering activities was not modelled as the volume would be smaller than a vessel collision event and therefore the modelling for the vessel collision scenarios would include the impacts that could be expected from a hydrocarbon release during bunkering activities.

ITOPF (2011) and the Australian Marine Oil Spill Centre (AMOSC, 2011) categorise diesel as a light ‘group II’ hydrocarbon. In the marine environment, a 10% residual of the total quantity of diesel spilt will remain after the volatilisation and solubilisation processes associated with weathering (RPS, 2024).

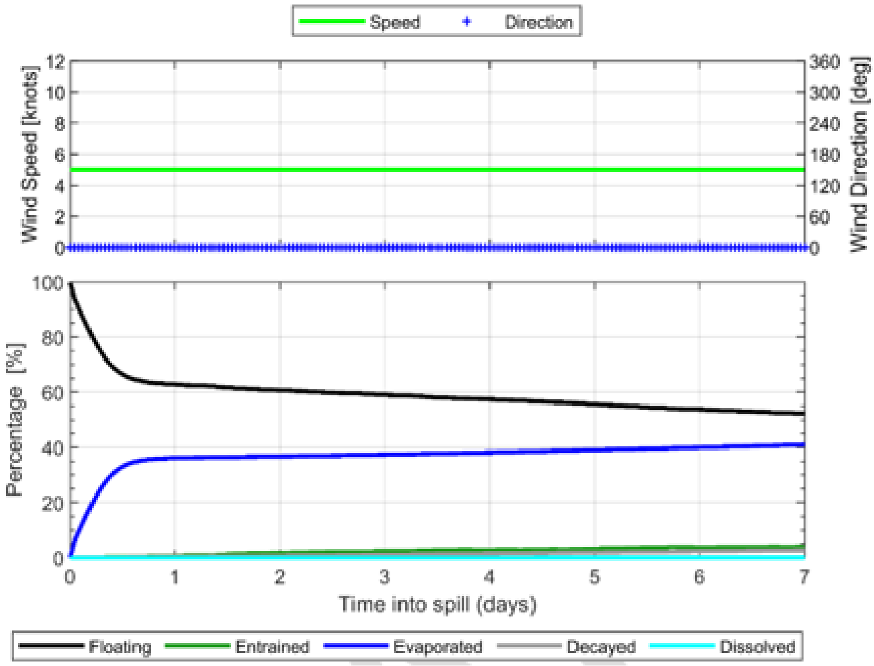
In the marine environment, diesel is expected to behave as follows:

- Diesel will spread rapidly in the direction of the prevailing wind and waves
- Evaporation will be the dominant process contributing to the fate of spilled diesel from the sea surface and will account for 60–80% reduction of the net hydrocarbon balance
- The evaporation rate of diesel will increase in warmer air and sea temperatures
- Diesel residues usually consist of heavy compounds that may persist longer and will tend to disperse as oil droplets into the upper layers of the water column.

Modelling of surface diesel spills by APASA (2024) indicates that at least 36.1% by volume would evaporate within 24 hours of release under calm conditions (Figure 7-3). The remaining diesel would mostly remain on the surface, where it would be subject to continuing weathering including evaporation and photo-oxidation, although at a slowed rate (RPS, 2024). Almost no diesel in this scenario is predicted to become entrained, and almost no aromatic hydrocarbons are predicted to become dissolved.

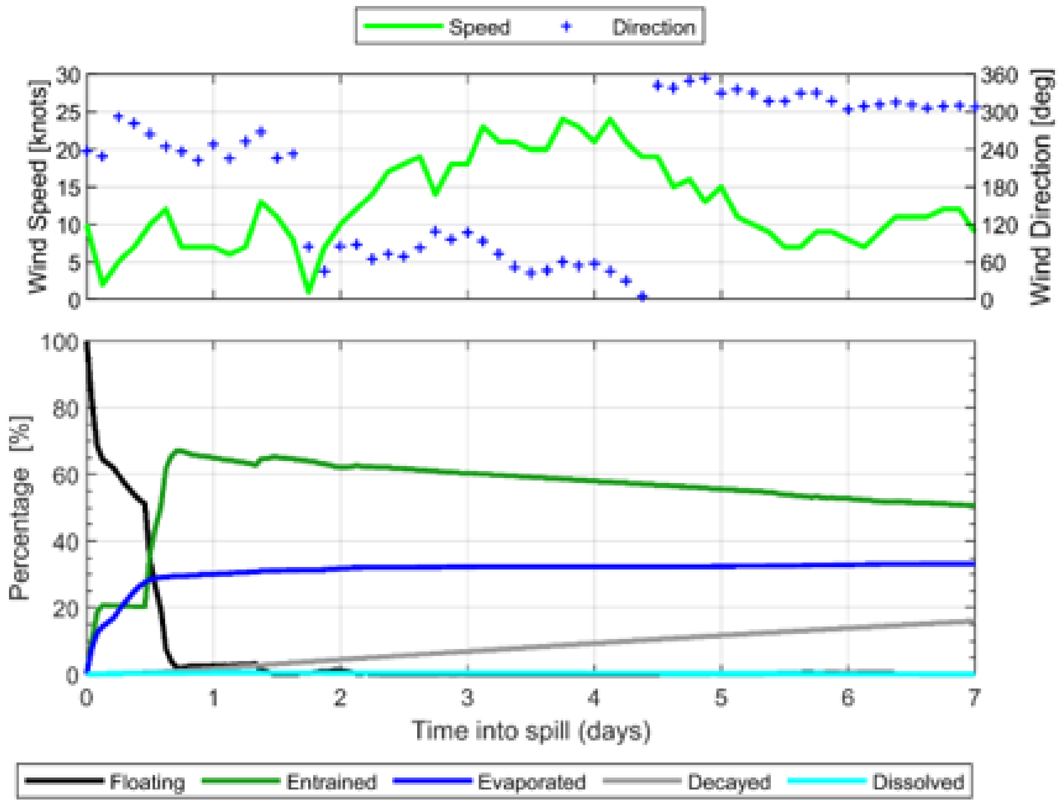
For the variable weather simulation (Figure 7-4), after 24 hours, 30% of the mass would evaporate, while 65% was expected to have entrained. Approximately, 2.6% of floating oil remains on the water surface. The low volatile and residual compounds are anticipated to entrain beneath the surface under conditions that generate wind waves (> ~12 knots). While the MDO is entrained, it is forecast to decay at a higher rate of 2.3% per day or 16% after 7 days, attributed to biological and photochemical degradation. This contrasts with a rate of 0.4% per day and a total of ~2.8% after 7 days for the constant-wind case.

Given the proportion of entrained MDO and its tendency to remain mixed in the water column, the remaining hydrocarbons are expected to undergo decay over several weeks. The intertidal and shoreline habitats at receptors within the EMBA and the sensitivities of these receptors to hydrocarbons are provided in the condensate risk assessment section in Table 7-13.



Source: APASA (2024).

Figure 7-3: Proportional mass balance plot representing the weathering of marine diesel spilled onto the surface as a once off release (50 m^3 over 1 hour) and subject to a constant five-knot wind at 27 °C water temperature and 25 °C air temperature



Source: APASA (2024).

Figure 7-4: Proportional mass balance plot representing the weathering of marine diesel spilled onto the surface as a once off release (50 m^3 over 1 hour) and subject to variable wind at 27 °C water temperature and 25 °C air temperature

The modelling results are presented in for the fate of hydrocarbon at the exposure values defined in Section 7.5.5. Table 7-22 has been provided for the purposes of risk evaluation, displaying the following parameters:

- Minimum time to contact from moderate and high exposure value
- Maximum hydrocarbon concentration from high exposure value
- Maximum oil loading on shoreline from moderate and high exposure value
- Length of shoreline oiled.

Further parameters required to inform spill response strategies are described further in the OPEP.

Floating oil – Commonwealth/State Water boundary

Low

Stochastic modelling determined that floating oil at the low exposure value is expected to reach up to 36 km from the spill site at concentration of 1 g/m^2. The maximum probability of contact is at the Dampier Archipelago at 0.67%. No other EVAs are expected to be contacted at the low exposure value.

Moderate

Stochastic modelling determined that floating oil at the moderate exposure value of 10 g/m^2 may reach only 25 km from the spill site. No EVAs are expected to be contacted at the moderate exposure value for floating hydrocarbons.

High

Stochastic modelling determined that floating oil at the high exposure value of 50 g/m^2 may reach only 12 km from the spill site. No EVAs are expected to be contacted at the high exposure value for floating hydrocarbons.

Floating oil – Reindeer WHP

Low

Stochastic modelling determined that floating oil at the low exposure value of 1 g/m^2 may reach 70 km from the spill site. No EVAs are expected to be contacted at the low exposure value for floating hydrocarbons.

Moderate

Stochastic modelling determined that floating oil at the moderate exposure value of 10 g/m^2 may extend up to 55 km from the spill site. No EVAs are expected to be contacted at the moderate exposure value for floating hydrocarbons.

High

Stochastic modelling determined that floating oil at the high exposure value of 50 g/m^2 may extend up to 13 km from the spill site. No EVAs are expected to be contacted at the high exposure value for floating hydrocarbons.

Shoreline accumulation – Commonwealth/State water boundary

Low

There is a 9.33% probability of shoreline accumulation at the low exposure value at Montebello Islands, 6% probability of accumulation at Lowendal Islands, 4.33% probability at Barrow Island and 1.67% probability at Dampier Archipelago.

Moderate

There is a 1.33% probability of shoreline accumulation at this exposure value at Montebello Islands and Lowendal Islands. There is a 0.67% probability of shoreline accumulation at Dampier Archipelago and 0.33% probability at Barrow Island. The maximum accumulated volume at any receptor is 24 m^3.

High

There is no probability of contact at any HEV above the high exposure value.

Shoreline accumulation – Reindeer WHP

Shoreline accumulation is expected to occur at a number of receptors within the EMBA but at very low volumes with the maximum volume being 2 m^3. Specific details of shoreline accumulation are provided below in the context of the low, moderate and high exposure values.

Low

Stochastic modelling shows that there is a 2% probability of shoreline accumulation above 10 g/m^2 at the Muiron Islands, a 1% probability of shoreline accumulation above 10 g/m^2 at the Montebello Islands and Southern Islands Coast and a 0.33% probability at the Ningaloo Coast North. The shortest time for oil accumulation was recorded for Montebello Islands at 95 hours.

Moderate and High

Stochastic modelling shows that there no contact at moderate and high exposure values for any EVA.

Dissolved oil – Commonwealth/State water boundary

Low

Stochastic modelling determined that dissolved oil at the low exposure value of 10 ppb is expected to reach 125 km from the spill site. Barrow-Montebello Surrounds, Lowendal Islands and Montebello Islands all recorded the highest probability of exposure (0.67%) at, or above, the 10 ppb threshold.

Moderate

Stochastic modelling determined that entrained oil at the moderate exposure value of 50 ppb is expected to reach 53 km from the spill site. No EVAs are expected to be contacted at the moderate exposure value for dissolved hydrocarbons.

High

Stochastic modelling determined that there will be no dispersal of dissolved oil at the high exposure value of 400 ppb from the spill site. Therefore, no EVAs are expected to be contacted at the high exposure value for dissolved hydrocarbons.

Dissolved oil – Reindeer WHP

Low

Stochastic modelling determined that dissolved oil at the low exposure value of 10 ppb may reach up to 243 km from the spill site. Montebello AMP has the highest probability of exposure to dissolved oil at 5.33%. All other receptors have a probability of <1% for exposure to dissolved hydrocarbons at the low exposure value.

Moderate

Stochastic modelling determined that dissolved oil at the moderate exposure value of 50 ppb may reach up to 83 km from the spill site. Montebello AMP has a 1% probability of exposure to dissolved hydrocarbons. No other EVAs are expected to be contacted at the moderate exposure value for dissolved hydrocarbons.

High

Stochastic modelling determined that there will be no dispersal of dissolved oil at the high exposure value of 400 ppb from the spill site. Therefore, no EVAs are expected to be contacted at the high exposure value for dissolved hydrocarbons.

Entrained oil – Commonwealth/State water boundary

Low/Moderate

Stochastic modelling determined that entrained oil at the low/moderate exposure value of 1,000 ppb may reach up to 36 km from the spill site. No EVAs are predicted to be exposed to entrained hydrocarbons at, or above, the 1,000 ppb threshold.

Entrained oil – Reindeer WHP

Low/Moderate

Stochastic modelling determined that entrained oil at the low/moderate exposure value of 1,000 ppb may reach up to 42 km from the spill site. Montebello AMP has a 1% probability of exposure to entrained oil. No other EVAs are expected to be connected at the 1,000 ppb exposure value for entrained hydrocarbons.

Santos

Table 7-22: Modelling results for surface release of hydrocarbons from a vessel collision at the CSB or WHP

Receptor	Receptor Type	Minimum time to contact (hours)							Maximum Hydrocarbon Concentration					Ma xim um	Ma xim um	Ma xim um
		Moderate exposure values				High exposure values			Moderate exposure values			High exposure values				
		Shoreline accumulation 100 g/m^2	Surface hydrocarbons (10 g/m^2)	Dissolved hydrocarbons (50 ppb)	Entrained hydrocarbon (1000 ppb)	Shoreline accumulation (1000 g/m^2)	Surface hydrocarbons (50 g/m^2)	Dissolved hydrocarbons (400 ppb)	Surface hydrocarbons (10 g/m^2)	Dissolved hydrocarbons (50 pb)	Entrained hydrocarbon (1000 ppb)	Surface hydrocarbons (50 g/m^2)	Dissolved hydrocarbons (400 ppb)	Shoreline accumulation g/m^2	Shoreline accumulation >100 g/m^2	Shoreline accumulation >100 g/m^2
CSB Location																
Barrow Island	Emergent	343	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	322	4	1
Dampier Archipelago	Emergent	58	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	906	21	5
Lowendal Islands	Emergent	133	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	167	4	2
Montebello Islands	Emergent	139	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	177	5	3
WHP Location																
Montebello Islands	Emergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	31	NC	NC
Muiron Islands	Emergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	58	NC	NC
Ningaloo Coast North	Emergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	14	NC	NC
Southern Islands Coast	Emergent	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	24	NC	NC
Montebello AMP	Submerged	NC	NC	19	19	NC	NC	NC	NC	111	1403	NC	NC	NC	NC	NC

NC = no contact

7.8.3 Environmental performance and control measures

Environmental performance outcome (EPO) relating to this event include:

- No loss of containment of hydrocarbon to the marine environment [EPO-RE-08].

Control measures applied to prevent an oil spill are shown in Table 7-23, and corresponding-EPSs and measurement criteria are described in Table 8-2

Selection of oil spill response strategies and associated EPOs, control measures and EPSs, including those required to maintain preparedness and for response, are detailed within the OPEP. The OPEP contains an evaluation of oil spill preparedness arrangements to demonstrate that oil spills will be mitigated to ALARP.

Table 7-23: Control measures evaluation for surface release of diesel

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-05	Lighting will be used as required for safe work conditions and navigational purposes	Engineering	Reduces risk of environmental impact from vessel collisions due to ensuring safety requirements are fulfilled and other marine users are aware of the presence of the WHP and vessels.	Costs of operating and maintaining navigational equipment.	Adopted – Benefits considered to outweigh costs.
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-14	Existing (gazetted) PSZ established around the WHP location.	Isolation	Petroleum safety zone applies around the Reindeer WHP and on Australian Nautical Charts. Reduces the potential for collisions with the platform resulting in a loss of hydrocarbon containment.	No additional costs to Santos. Other marine users may be temporarily excluded from areas, disrupting their activities.	Adopted – Regulatory requirement must be adopted. Excluding other marine users within a 500 m-radius of the Reindeer WHP is unlikely to significantly impact upon the marine user. The benefits to safety of the activity (thus reducing risk of environmental impacts due to vessel collisions) outweigh potential costs.
RE-CM-15	Navigational charts	Administrative	Provides a means for other marine users to be aware of the presence of	Costs associated with personnel time in issuing notifications.	Adopted – Benefits considered to outweigh costs.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			the platform and vessels.		
RE-CM-16	Seafarer Certification.	Administrative	Requires appropriately trained and competent personnel, in accordance with Marine Order 70, to navigate vessels to reduce interaction with other marine users.	Costs associated with personnel time in obtaining qualifications.	Adopted – Benefits considered to outweigh costs, and it is a legislated requirement.
RE-CM-35	Vessel spill response plan (SOPEP/SMPEP).	Administrative	Implements response plans on board vessels to deal with unplanned hydrocarbon releases and spills quickly and efficiently in order to reduce impacts to the marine environment.	Administrative costs of preparing documents. Generally undertaken by vessel contractor, so time for Santos personnel to confirm and check SOPEP/SMPEP is in place.	Adopted – Benefits considered to outweigh costs.
RE-CM-42	Hazardous chemical management procedures.	Administrative	Reduces the risk of spills and leaks (discharges) of hydrocarbons to sea by controlling the storage, handling and clean-up.	Personnel cost associated with implementation of procedures and permanent or temporary storage areas.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweigh costs.
RE-CM-43	Santos Refuelling and chemical transfer standard (SO 91 IO00098).	Administrative	Minimises risk of pollution to ALARP during chemical transfers from an offshore support vessel to an offshore facility as well as refuelling of fixed or portable equipment and machinery.	Personnel costs associated with ensuring procedures are in place and implemented during inspections.	Adopted – Benefits of ensuring procedures are followed and measures implemented outweigh the costs of personnel time.
RE-CM-44	Spill response equipment on producing offshore platforms.		Provides a means to prevent any deck spills of hazardous liquids (including hydrocarbons) reaching the sea.	Costs associated with stocking spill response equipment on vessels and offshore platforms, training personnel and maintaining equipment.	Adopted – Benefits of stocking, using and maintaining spill response equipment outweighs the costs of personnel time and costs of maintenance and training.
RE-CM-51	Accepted Oil pollution emergency plan (OPEP).	Administrative	Implements response plan to deal with an unplanned hydrocarbon spills quickly and efficiently in order	Personnel and administrative costs associated with preparing documents, ongoing management (spill	Adopted – Benefits of ensuring procedures are followed and control measures

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			to reduce impacts to the marine environment.	response exercises) and implementation of OPEP.	implemented outweigh costs to Santos.
RE-CM-52	Support vessel positioning.		Allows the vessel to maintain accurate positioning and reduces potential to impact the platform.	Costs associated with requiring vessels to have appropriate positioning systems; however, these are standard on certain classes of vessel.	Adopted – The benefits to safety and the environment, (thus reducing risk of environmental impacts due to vessel collisions) outweigh potential costs.
RE-CM-53	Emergency power system is provided on Reindeer WHP to secure secondary power source for safety integrity system.		Provides backup power for the offshore safety integrity system for control of emergency shutdowns in abnormal operational situations.	Costs associated with the personnel time in performing the testing and maintenance.	Adopted – Benefits of ensuring procedures are followed and control measures implemented outweigh costs to Santos WA.
Additional Control Measures					
N/A	Require all support vessels involved in the activity to be double hulled.		Reduces the likelihood of a loss of hydrocarbon inventory in the highly unlikely event of a vessel collision, minimising potential environmental impact.	Vessels are subject to availability and are required to meet Santos' standards during activities; requirement of a double hull on vessels would limit the number available to Santos; requiring vessels to be refitted to ensure double hulls would also be of high cost.	Rejected – Large costs associated with vessel selection and by having an activity schedule determined by vessel availability considered grossly disproportionate compared to low risk of a vessel collision and low risk of a large diesel spill.
N/A	No diesel bunkering.		Removes potential spill scenario.	Although not expected to occur frequently, the need for operational bunkering may arise during activities. Diesel bunkering offshore is considered to be a standard practice, with controls in place and risks well understood by the industry.	Rejected – In order to maintain the required level of flexibility, the ability to undertake bunkering of diesel is required. Potential risks are further reduced by not undertaking vessel-to-vessel or vessel-to-platform fuel transfers.

Santos

7.8.4 Environmental impact assessment

The below environmental impact assessment follows the risk assessment approach detailed in Section 7.5.6.

7.8.4.1 Identification of hotspots for consequence analysis

As described in Section 7.5.6 all HEVs within the EMBA (low exposure value) are listed in Table 7-24. The values and sensitivities associated with these HEVs have been described in Section 2.11. Further to this, Table 7-24 filters the HEVs to identify the hotspots where they meet the criteria in Section 7.5.6. This assessment has found that there are four hotspots from the vessel spill scenario at the CSB.

Table 7-24: Identified high environmental value hotspot receptor

Receptor	HEV Value	Exposure Value			Hotspot
		Low	Moderate	High	
Barrow Island	3	✓	✓		✓
Barrow-Montebello Surrounds	3	✓			
Dampier Archipelago	4	✓	✓		✓
Lowendal Islands	3	✓	✓		✓
Montebello AMP	4	✓			
Montebello Islands	3	✓	✓		✓

This process identified the following hotspots and rationale for their selection are shown below.

Table 7-25: Determination and rationale for the hotspots

Hotspots	Type	HEV Ranking	Hotspot	Rationale
Barrow Island	Emergent	3	Yes – Discretionary	**Discretionary**: Does not meet default criteria as <5% probability (4.33% probability of shoreline oil at low threshold). Shoreline accumulation also <5% probability but there is 4 m^3 shoreline accumulation predicted.
Lowendal Islands	Emergent	3	Yes	**Meets standard criteria:** HEV = 3 and shoreline accumulation >5% probability at low threshold. Max accumulated volume 4 m^3
Montebello Islands	Emergent	3	Yes	**Meets standard criteria:** HEV = 3 and shoreline accumulation >5% probability at low threshold. Max accumulated volume 5 m^3
Dampier Archipelago	Emergent	4	Yes – Discretionary	**Discretionary**: Does not meet default criteria as an HEV of 4 and <5% probability of shoreline oil. However, has the greatest volume of shoreline accumulation >100g/m^2 (21 m^3)

Table 7-18 provides a simplified summary of the consequence assessment results for each of the Hotspot areas. The consequence assessment was based on predicted contact and concentration of floating oil, accumulated oil, entrained oil and dissolved aromatic hydrocarbons (DAHs) as indicated. For each Hotspot area the consequence to the key values were assessed using the methodology described in Section 5.2.

Table 7-26: Hotspot consequence assessment results from loss of marine diesel due to a vessel collision at the CSB

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Diesel release	Consequence category	Worst-case consequence ranking	Total
Barrow Island (emergent)		Habitats • Bandicoot Bay – conservation area Fisheries Act (benthic fauna/seabird protection), mudflats, rock platforms, mangroves, clay pans • Mangroves in Bandicoot Bay (considered globally unique) • Coral reefs (eastern side) – Biggada Reef (coral spawning: Mar and Oct) • Biggada Creek Turtles • Regionally and nationally significant green turtle (western side) and flatback turtle (eastern side) nesting beaches • Turtle Bay north beach • North and west coasts – John Wayne Beach also loggerhead and hawksbill turtles. • Peak turtle nesting periods – Loggerhead turtle nesting: Dec–Jan; green turtle nesting: Nov–Apr, peak period from Jan–Feb; flatback turtle nesting: Dec–Jan; hawksbill turtle nesting: Oct–Jan Seabirds • Migratory birds (important habitat) (important bird area) 10th of top 147 bird sites. • Highest population of migratory birds in Barrow Island Nature Reserve (south-southeast island). • Double island important bird nesting (shearwaters, sea eagles). Marine mammals • Pygmy blue whale northern migration (Apr–Aug) • Cultural heritage • Important Aboriginal cultural: 13 listed sites incl. (pearling camps) Socio-economic • Significant for recreational fishing and charter boat tourism	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• II • II • II • II	II
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NC			
			Maximum accumulated oil on shoreline >100g/m^2	(tonnes)	4			
			Maximum accumulated concentration	(g/m^2)	322			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	1			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	NC			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	NA			

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Diesel release	Consequence category	Worst-case consequence ranking	Total
		Nominated place (national heritage)						
Lowendal Islands (Emergent)	3	Habitats • Important shallow lagoons with seagrass for dugongs • Deep-water benthic (soft-sediment) habitats • Dugong Reef and Batman Reef (eastern side Island) • Mangroves are considered globally unique as they are offshore • Macroalgal reefs (40%) Turtles • Important hawksbill (Beacon, Parakeelya, Kaia and Pipeline), loggerhead and green turtle nesting (minor) Varanus pipeline, Harriet and Andersons Beaches) • Nesting is reported to occur throughout the year in WA, peaking between October and January • Significant flatback rookery, nesting season for flatback turtles peaks in December and January with subsequent peak hatchling emergence in February and March Seabirds • Approximately 89 species of avifauna, 12–14 species of migratory and threatened seabirds Marine mammals • Seagrass beds around the Lowendal Islands thought to provide valuable food source for dugongs Protected Areas • The Barrow Island Marine Management Area, most of the waters around Barrow Island, the Lowendal Islands and the Barrow Island Marine Park Socio-economic and heritage values Social amenities and other tourism, very significant for recreational fishing and charter boat tourism	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• III • III • III • III	III
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NA			
			Maximum accumulated oil on shoreline >100g/m^2	(tonnes)	4			
			Maximum accumulated concentration	(g/m^2)	197			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	2			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	18			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	NC			
Montebello Islands	3	Habitats	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC			III

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Diesel release	Consequence category	Worst-case consequence ranking	Total
(Emergent)		• Reefs – coral spawning: Mar and Oct • Algae (40%) • Mangroves (considered globally unique as they are offshore) • Fish habitat • Intertidal sand flat communities Turtles • Loggerhead and green (significant rookery), hawksbill, flatback turtles – Loggerhead turtle nesting: Dec–Jan; green turtle nesting: Nov–Apr, peak period from Jan–Feb; flatback turtle nesting: Dec–Jan; hawksbill turtle nesting: Oct–Jan • Northwest and Eastern Trimouille Islands (hawksbill) • Western Reef and Southern Bay at Northwest Island (green) Seabirds • Migratory and threatened seabirds – 14 species • Significant nesting (Sep–Feb), foraging and resting areas Whales • Humpback (Jun–Jul), pygmy blue (Apr–Aug) whale migration Socio-economic • Pearling (inactive/pearling zones) • Very significant for recreational fishing and charter boat tourism Social amenities and other tourism Nominated place (national heritage)	Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NA	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• III • III • III • III	
			Maximum accumulated oil on shoreline >100g/m^2	(tonnes)	3			
			Maximum accumulated concentration	(g/m^2)	177			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	3			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	22			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	NC			
Dampier Archipelago	4	Physical Habitats • Coral reefs • Seagrass • Macroalgae • Mangroves	Probability of contact by floating oil at ≥10 g/m^2	(%)	NC	• Threatened/migratory fauna • physical habitat • protected areas • socio-economic receptors	• II • II • II • II	II
			Minimum time to contact by floating oil at ≥10 g/m^2	Time (h)	NC			
			Maximum accumulated oil on shoreline >100g/m^2	(tonnes)	21			

Receptor name	HEV ranking	Values	Oil spill modelling parameter		Diesel release	Consequence category	Worst-case consequence ranking	Total
		Marine Fauna • Invertebrates • Finfish and Rays • high fish biodiversity approx. 650 species, dwarf sawfish EPBC protected • Birds • Marine reptiles Turtles • Flatbacks – nest on Legendre, Hauy, Delambre • Green – significant rookery in NWS • Olive Ridley – known to forage • Loggerhead – nesting and foraging • Seasnakes Marine mammals • Eight species (dugong, whales, dolphins) • migratory pathway for protected humpback whale in July-Sept. • Protected Area • Commonwealth Marine Reserve Socio-economic and heritage values • National Heritage Listed Aboriginal rock art on shorelines, Burrup Peninsula	Maximum accumulated concentration	(g/m^2)	906			
			Maximum length of shoreline oiled (≥100 g/m^2)	(km)	5			
			Maximum concentration of entrained oil	(ppb)	NC			
			Minimum time to contact by entrained oil ≥1000 ppb	Time (h)	NA			
			Maximum concentration of dissolved hydrocarbons	(ppb)	11			
			Minimum time to contact by dissolved oil ≥50 ppb	Time (h)	NC			

Description – Surface Release of Diesel	
Receptors	Physical environment (water quality and benthic habitats) Marine fauna (cetaceans, turtles, sharks, fish (pelagic), rays, seabirds, benthic fauna, plankton) Protected areas – KEFs and Marine Parks Socio economic receptors (commercial and recreational fishing, tourism, shipping, defence, heritage, indigenous heritage such as totemic sp., cultural heritage sites, sea country and spiritual values, other petroleum activities).
Consequence	III – Moderate

A summary of the consequence assessment for each receptor category is presented below. Potential impact pathways (physical and chemical) of hydrocarbon exposure for receptors are summarised in Table 7-12 , and potential impacts to receptors found within the EMBA are further described in Table 7-13.

Physical environment

In the event of MDO release, hydrocarbons that reach nearshore environments have the potential to impact benthic coral reefs and mangrove areas which may result in a decrease in ecological values, given toxicity impacts associated with hydrocarbon exposure. The quality of habitat may be reduced for a period with recovery over the short term (up to two years). As described above, accumulated hydrocarbons on shorelines could impact marine fauna that utilise beaches such as shorebirds and turtles, dependent upon the timing of a spill. Beaches on the Dampier Archipelago are important for flatback turtles and green turtles, while Montebello Islands are an important nesting site for loggerhead turtles. Impacts to turtles could occur from surface hydrocarbons if MDO accumulates on nesting beaches. Entrained hydrocarbon could contact sandy beaches at high tide. Such impacts would be most likely to nesting female turtles as they move up and down beaches or to turtle hatchlings as they emerge from nests six to eight weeks following nesting. The quality of habitat available to the turtles may be reduced, however, recovery is expected over the short term (up to two years).

Threatened and migratory fauna

A surface release of MDO to the marine environment would result in a localised reduction in water quality in the upper surface waters of the water column. 36.1% of MDO is predicted to evaporate within 24 hours under constant wind conditions and under stronger wind and breaking wave conditions, around 80.5% of the MDO will have entrained and additional 15% is expected to have evaporated within 24 hours of the spill. Therefore, only <1% of floating oil will remain on the water surface indicating that surface slick will be temporary. Surface oil, and entrained hydrocarbon in the sea surface layer, could have the physical effect of coating fauna interacting within and under the surface, including plankton, pelagic invertebrates and fishes, marine reptiles, marine mammals, and seabirds, and may also affect some species through ingestion of oiled fish (as described in Table 7-12).

Barrow island and Montebello islands are important areas for bird nesting. An unplanned release of MDO is not expected to interfere with their breeding activity, but could cause slight secondary effects through ingestion after preening or ingestion of oiled fish (as described in Table 7-12)

Deteriorating water quality/chemical and terrestrial discharge is identified as a potential threat to turtles in the marine turtle recovery plan, and some bird and shark species. Habitat modification, degradation and disruption, pollution and/or loss of habitat are also identified as threats to sharks, birds, cetaceans and turtles in conservation management and recovery plans. Given the offshore location of the release, and volume of potential hydrocarbon release there is little potential for modification to or a decrease in the availability of quality habitat (shorelines/subsurface). Shoreline accumulation may present a major disruption to shoreline individuals. The volumes of accumulated MDO are unlikely to result in a major reduction in area available for seabirds and/or turtles species. The quality of some habitat at Dampier Archipelago and Montebello islands (shorelines/subsurface) may be reduced for a period, with recovery within two years.

Protected areas

The surface release of MDO is expected to intersect the Montebello AMP and Dampier Archipelago National Heritage area (Table 7-24) . Impacts to the habitat/fauna receptors described above therefore have an impact on the values of these reserves which could have flow-on effects to tourism revenue of coastal communities that provide access to these marine reserves.

Socio-economic receptors

There is the potential for hydrocarbons to temporarily disrupt fishing activities if the surface or entrained hydrocarbon moves through fishing areas. However, the high rate of evaporation means little MDO will become entrained, and few aromatic hydrocarbons are predicted to become dissolved.

It is possible there could be accumulation of oil in fish tissues to the extent that could result in hydrocarbon tainting of fish flesh. Connell and Miller (1981) compiled a summary of studies listing the exposure value concentrations at which tainting occurred for hydrocarbons. The results contained in their review indicate tainting of fish occurs when fish are exposed to

Description – Surface Release of Diesel	
ambient concentrations of 4 to 300 ppm (4000–300,000 ppb) of hydrocarbons in the water, for durations of 24 hours or more, with response to phenols and naphthenic acids being the strongest. Given the volume of oil that could be potentially released and minimal fishing efforts, the impacts to fisheries on a stock level will not lead to significant reduction of population supporting the local activity. Tourism could also be affected by a spill, either from reduced water quality/shoreline oiling preventing recreational activities or reducing aesthetic appeal or from impacts to habitats and marine fauna. However, considering the characteristics of MDO, the impact will be short term and temporary. Cultural Heritage and Features Shoreline accumulation or contact by floating oil to an emergent receptor is not expected. However, potential impacts to cultural features from a hydrocarbon spill may include decline in traditional food sources and /or mortality of fauna with cultural significance. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. On the basis of the above assessments, a surface diesel release at the Reindeer WHP or the Commonwealth–State waters boundary has the potential to impact receptors in the water column. Given the limited extent, the worst-case consequence is considered to be III-Moderate based on a vessel collision scenario.	
Likelihood	B – Unlikely
The likelihood of a hydrocarbon release occurring due to a vessel collision/bunkering is limited, given the set of mitigation and management controls in place. Subsequently the likelihood of a vessel collision releasing hydrocarbons to the environment resulting in a minor consequence is considered to be Unlikely (b).	
Residual Risk	Low

7.8.5 Demonstration of ALARP

The use of support vessels is integral to the functioning of the facility; therefore, vessels and the associated risk of a diesel release cannot be completely eliminated. Vessel presence is required during the activities in order to transfer supplies and equipment to the facility, offload equipment and waste, and perform inspection, maintenance, monitoring and repair activities. Helicopter transfers are used to transfer crew to and from the facility but cannot accommodate the volumes of supplies and waste material that are transferred by vessel; thus, there is no substitute for vessel-to-vessel loading.

Offshore refuelling is standard industry practice; and oil pollution legislation, including Protection of the Sea (Prevention of Pollution from Ships) Act 1983 and Marine Order 91, have been developed to safeguard against the risk of an unplanned hydrocarbon spill occurring during refuelling (bunkering). The risk of a diesel spill during refuelling has been further reduced through the platform using solar power as the primary energy source, which reduces the frequency of diesel transfers to the Reindeer WHP.

Given the controls in place detailed above, the assessed residual risk for this impact is Medium and cannot be reduced further. It is considered therefore that the impact of the activities conducted are reduced to ALARP.

In terms of spill response activities, Santos will implement oil spill response as specified within the vessel SOPEP/SMPEP and/or OPEP. A detailed ALARP assessment on the adequacy of arrangements available to support spill response strategies and control measures is presented in the OPEP.

7.8.6 Acceptability evaluation

Is the risk ranked between Very Low to Medium?	Yes – Maximum credible spill volume from vessel collision (325 m^3) residual risk is ranked as *Low*.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Management consistent with OPGGS Regulations including Safety Case and WOMP. Santos has considered the values and sensitivities of the receiving environment including, but not limited to: • Conservation values of the identified protection priorities including a number of Australian Marine Parks.

	Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The potential impacts and risks from diesel spills are well understood, and the event will be managed in accordance with relevant legislation and standards. With the implementation of industry standards and activity-specific control measures to reduce the likelihood of a diesel spill event (and minimise impacts), the residual risk is assessed to be Medium and ALARP The control measures proposed are consistent with applicable actions described in the relevant recovery plans and approved conservation advice and no stakeholder concerns have been raised regarding this aspect.

Therefore, it is considered that the proposed control measures will reduce the risk of impact from a diesel spill to a level that is acceptable.

7.9 Unplanned release of treated seawater

7.9.1 Description of event

Event	Once the Reindeer facilities reach the end of field life they will need to be flushed of hydrocarbons and preserved for future decommissioning or other uses. Following flushing of the pipeline to DCGP, the pipeline will be filled with treated seawater. Following flushing the pipeline may be re-preserved with treated seawater or an inert gas such as nitrogen. It is considered credible that an unplanned release of treated seawater or nitrogen could occur from the subsea DC supply pipeline during CoP (preservation) phase. An unplanned release of nitrogen is assessed in Section 7.9. The potential hazard sources that could cause an unplanned release of treated seawater from the DC supply pipeline include: • Internal/external corrosion • Anchor impact dragging • Loss of suspended load from a visiting vessel This maximum credible release would result in a subsea pipeline leak of 1,740 m^3 of treated seawater (containing chemicals and residual hydrocarbons) over 12 minutes with a discharge rate of 8,886 m^3/hr. 12 minutes is the time calculated to reach pressure equalisation. Initial concentrations of the chemical treatment and hydrocarbons in the discharged seawater are assumed to be 1,000 ppm and 30 ppm, respectively. Santos plans to use a combined biocide and oxygen scavenger chemical treatment package, likely Hydrosure 0-3670R, for treating seawater and preserving flowlines. The treated seawater will comprise seawater, oxygen scavenger (to control corrosion) and biocide (to prevent biofouling on the internal surfaces of the pipeline) that have been assessed through the Santos chemical selection procedure to ensure that environmentally acceptable products are used or the risks can be demonstrated to be ALARP from the use of other chemicals. There are no events identified that could result in a pin hole leak in the DC supply pipeline less than the low-pressure alarm trigger (6000 kPa), other than a cyclone.
Extent	A subsea release from the DC supply pipeline spill scenario is credible anywhere along the DC supply pipeline in Commonwealth waters. An unplanned subsea release from the DC supply pipeline of 1,740 m^3 at the State waters boundary has been modelled, as this is the location closest to sensitive receptors. The results from the modelling indicate that at a concentration level of PC99% (at, or above, 0.06 ppm), the maximum distances from the release location were 0.19 km for the 50th percentile and 14.78 km for the 95th percentile.
Duration	The duration of the release is estimated at 12 minutes at a rate of 8,886 m^3/hr.

7.9.2 Nature and scale of environmental impacts

Potential receptors: physical environment (water quality, benthic habitat); threatened, migratory or local fauna; socioeconomic receptors; and cultural features.

The potential environmental impacts from planned treated seawater discharges include:

- temporary localised decline in water quality in the immediate vicinity of the discharge
- toxicity to marine fauna.

7.9.2.1 Modelling Parameters and results

Modelling parameters and setup

RPS (2024c) simulated near-field mixing and dispersion of an unplanned release of treated water using the three-dimensional flow model, CORMIX. A summary of the treated seawater discharge characteristics are presented in

Table 7-27 The discharge was assumed to occur 38 m below the sea surface as a full bore rupture. The discharge was anticipated to have a salinity and temperature as per ambient waters.

Table 7-27: Summary of the treated seawater discharge characteristics

Parameter	Inputs
Total volume of treated seawater released (m^3)	1,740
Flow rate (m^3/hr)	8,886
Internal diameter of outlet pipe (mm)	374.66
Outlet pipe orientation	Full bore rupture
Discharge location	Pipeline at CSB
Water depth at discharge (m)	38
Discharge temperature (same as ambient seawater)	26.2
Discharge salinity (same as ambient seawater)	35.4

Far-field modelling was completed to allow the time-varying nature of currents to be included and for the potential for localised build-up when current speeds are low (e.g. at the turning of the tide) and recirculation of the plume back to the discharge location might occur. The mixing and dispersion of the chemical treatment and hydrocarbons was predicted using the three-dimensional discharge and plume behaviour model, MUDMAP. 25 simulations were run for each season (3) and each simulation had a different start time, which ensured a range of current conditions were sampled. In total 75 simulations were modelled as part of the assessment, which were reported on an annual basis (RPS, 2024c). Each simulation was run for 72 hours.

Note the concentrations presented assume the background concentration of the chemical treatment and hydrocarbons in the receiving waters is zero and there is no biodegradation of the chemical treatment during the simulation.

Whole of Effluent Toxicity T Testing

To evaluate the environmental impact of an unplanned release of treated seawater into the marine environment, Santos utilised the Whole of Effluent Toxicity (WET) testing study conducted for Hydrosure by Chevron (Chevron, 2015). As this is likely the type of combined water treatment chemical that will be utilised for preservation of the DC supply pipeline. This testing study aimed to determine the potential toxicity of the effluent on a variety of local marine species under different exposure concentrations. The results of ecotoxicology testing undertaken by Chevron (Chevron,2015) on Hydrosure are presented in Table 6-20.

Based on an initial concentration of 1,000 ppm for the chemical treatment in the treated seawater, the necessary dilution to achieve the target concentration of 0.06 ppm for the PC99% is 1:16,667. The NOEC values for varying species protection levels and the dilutions to achieve the concentration based on an initial dosage of 1,000 mg/L are presented in Table 7-28. A 1:16,667 dilution is required to achieve a PC99%.

Table 7-28: Species protection concentrations for Hydrosure 0-3670R (from Chevron, 2015)

Species protection level	NOEC threshold (mg/L)	Dilutions required to achieve the NOEC threshold based on an initial dosing concentration of 1,000 ppm (mg/L)
PC99%	0.06	1:16,667
PC95%	0.10	1:10,000
PC90%	0.15	1:6,6667
PC80%	0.23	1:4,348

Far field modelling results

All 75 simulations were consolidated and analysed to generate annual-based results. Figure 7-5 and Figure 7-6 illustrate the predicted extents for the 50th and 95th percentile chemical treatment concentrations. As outlined in Figure 7-5 the 50th percentile chemical concentration extends up to 0.19 km from the discharge point. In Figure 7-6 the 95 percentile chemical concentration extends up to 14.78 km from the discharge point. However it reaches a low concentration of 0.15-0.23 ppm within 10 km of the discharge point. The modelling results also indicate that the chemical concentrations do not exceed NOEC thresholds for more than 36 hours. These figures reveal that the plume predominantly aligns along the northeast-southwest axis, consistent with the prevailing current directions at the site.

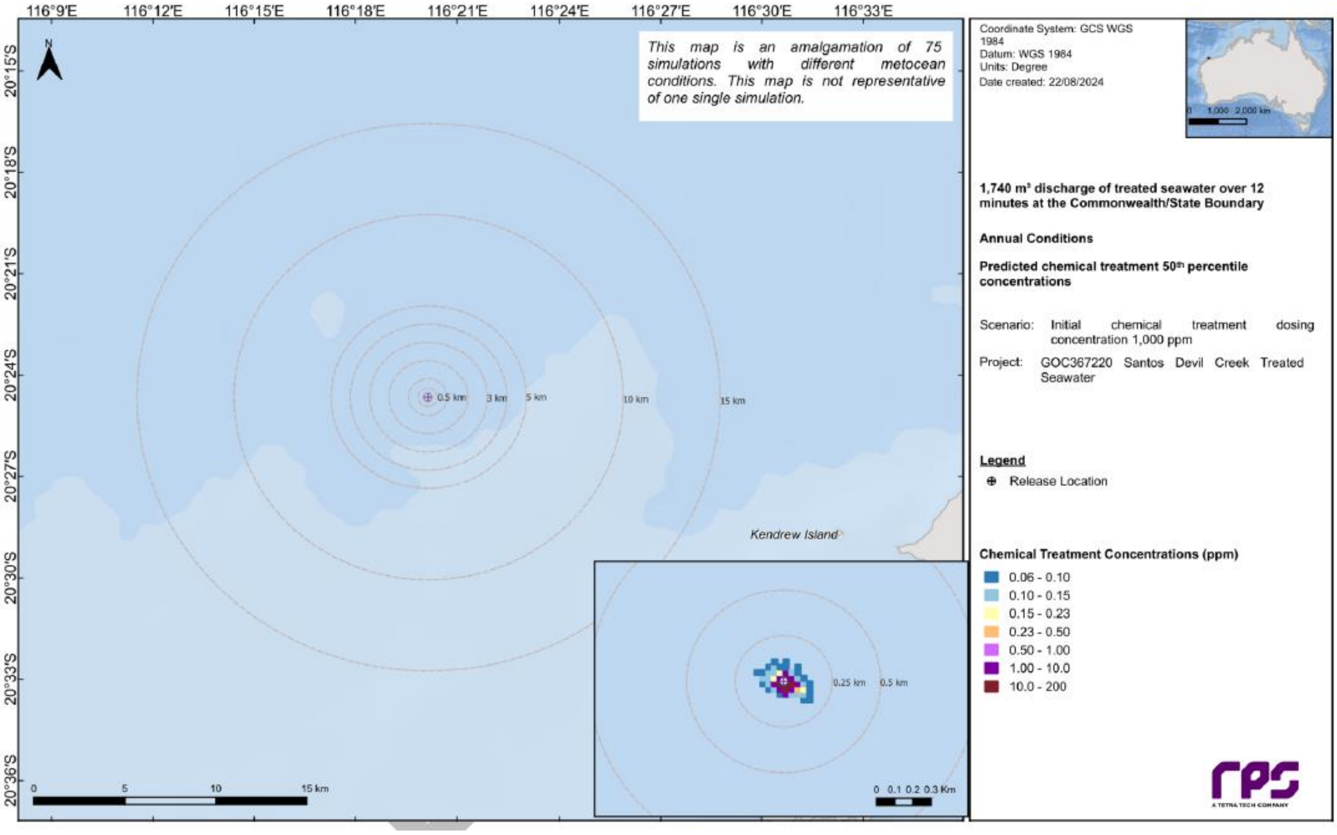


Figure 7-5: Predicted extent of the 50th percentile chemical treatment concentrations (annualised)

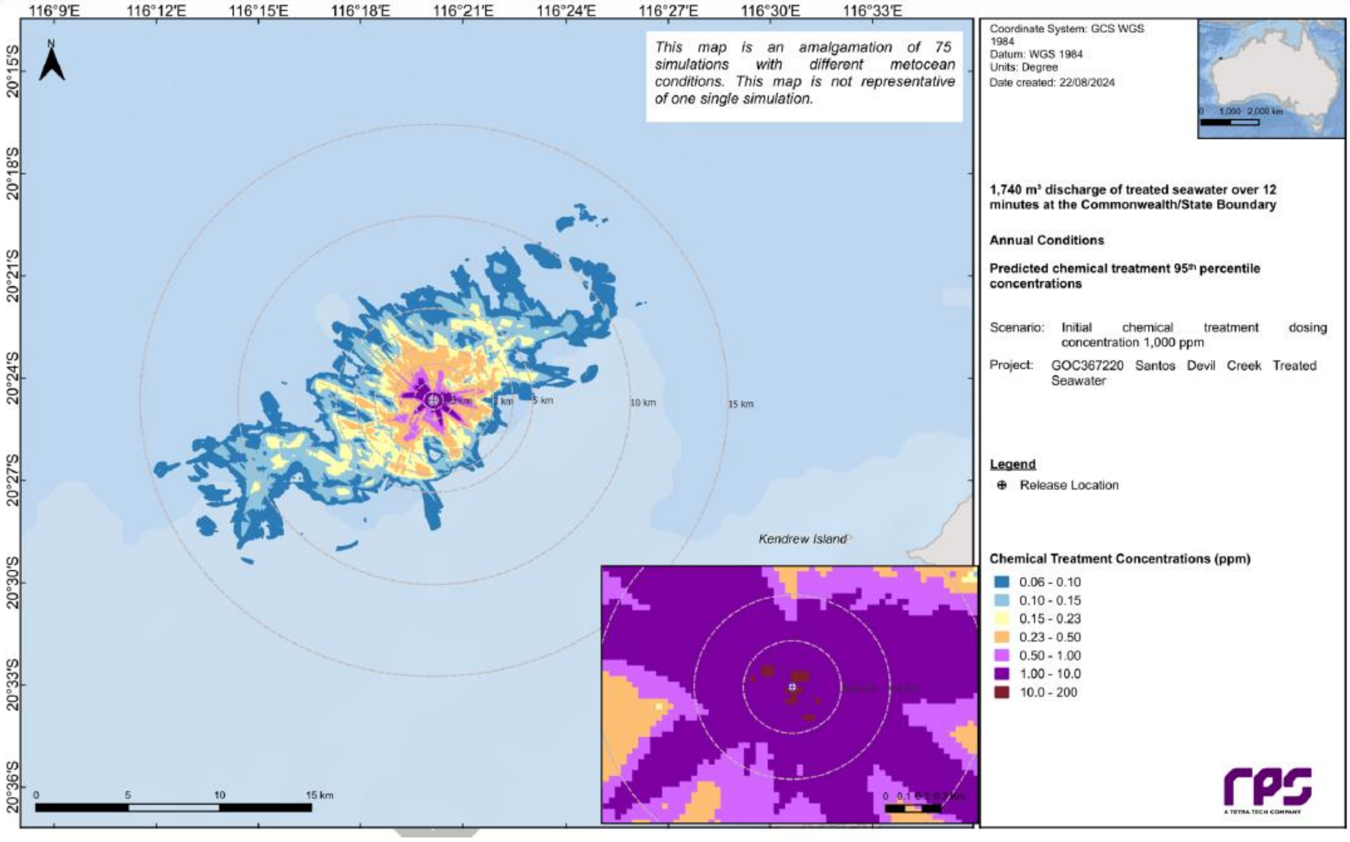


Figure 7-6: Predicted extent of the 95th percentile chemical treatment concentrations (annualised

Table 7-29 provides a summary of the maximum distances from the CSB release point to achieve the NOEC values for varying species protection levels for the 50th and 95th percentile concentrations.

Table 7-29: Maximum distances from the release location to achieve the NOEC values for varying species protection levels for the 50th and 95th percentile chemical treatment concentrations

Initial chemical treatment concentration (ppm)	Species protection level	NOEC value (mg/L)	Maximum distance (km) from the CSB to the exposure value based on the 50th percentile statistics	Maximum distance (km) from the CSB to the exposure value based on the 95th percentile statistics
1,000	PC99%	0.06	0.19	14.78
	PC95%	0.10	0.15	14.56
	PC90%	0.15	0.13	10.57
	PC80%	0.23	0.11	5.92

7.9.2.2 Impacts to physical environment

Water quality

It is important to note that the modelled results presented are considered conservative, as the Hydrosure discharge concentration was set at the maximum dosage rate of 1000 ppm, whereas the likely dosage rate may be less than this. In practice, the concentration of Hydrosure in the treated seawater will naturally degrade over time during the discharge and reduce in concentration within the pipeline. As a result, it is anticipated that the expected initial discharge concentrations of Hydrosure will be less than those modelled. Furthermore, mixing and dilution of the effluent in the receiving waters will occur, which is likely to result in mixing zone boundaries being reached closer to the discharge point compared to that predicted by the modelling outputs.

The unplanned release of treated sea water will result in a localised (around the discharge location) and temporary minor reduction in water quality. The modelling results indicate that chemical concentrations do not exceed the NOEC thresholds for more than 36 hours. Chemicals that will be used are inherently biodegradable with low potential for bioaccumulation. For the above reasons, no substantial change in water quality is expected from unplanned discharge and therefore the impact is assessed as negligible.

Plankton

Plankton drifting past the outlet at the time of discharge may be exposed to concentrations above those that could elicit an effect. However, dilution of the plume is rapid and the exposure concentration travelling with the organism will continually reduce. Plankton are widely distributed in the ocean and regenerate rapidly and, in the context of their lifecycle, impacts will be short term and negligible.

Sediment quality

The far-field modelling results showed that the plume was neutrally buoyant and predominantly located within 15 m above the seabed. Therefore, no impact to sediment quality is expected.

7.9.2.3 Impacts to threatened or migratory fauna

As discussed in the sections above, the discharge extent for the unplanned release of treated seawater discharge is localised (up to 14.97 km), and rapid dilution is predicted to occur within the offshore waters. Unplanned discharges of treated sea water may result in toxicity to marine life, with the effects greater on simpler life forms. This is illustrated in the ecotoxicological data in which the NOEC for a fish species is 12.5 ppm (time-weighted average) compared to 1.3 ppm for algae (Table 6-20). Modelling results indicate that chemical concentrations will not exceed NOEC thresholds for more than 36 hours.

Marine fauna in the vicinity of the CSB are likely to be transient. If present, marine fauna could pass through the plume of treated seawater and would be exposed for a short duration.

The CSB overlaps the following BIAs:

- The humpback whale migration BIA
- The flatback turtle internesting BIA
- The green turtle nesting BIA
- The hawksbill turtle nesting BIA
- The wedge-tailed shearwater and roseate tern breeding BIAs

Therefore these species are more likely to be encountered in the vicinity of the unplanned release. However, if contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and the transient fauna movement, such that any exposure is likely not of sufficient duration to cause a toxic effect within the radius of the potential affected area. Turtle nesting BIAs in the area will not be significantly modified of affected, as the unplanned release of treated seawater undergoes rapid dilution and dissipation in the open ocean waters. The modelling results also indicate that the NOEC will not be exceeded for more than 36 hours.

Discharges may cause changes to behaviour in marine fauna (avoidance). However, this release is expected to undergo rapid dilution and dispersion, so any behavioural impacts are expected to be minimal and short term.

Toxicity impacts to receptors from the release of treated seawater are unlikely to eventuate because:

- strong ocean currents result in the discharge being further diluted upon release to the marine environment, so the duration of exposure of chemicals to fauna will be minimal
- the chemicals will have been risk assessed for their suitability for discharge using Operations Chemical Selection Evaluation and Approval Procedure (EA-91-II-10001)
- the sensitivity of the receiving environment is considered low
- potential discharges will short term and temporary within the operational area.

7.9.3 Environmental performance and control measures

Environmental performance outcomes (EPOs) relating to this event include:

- No unplanned objects, emissions or discharges to sea or air [EPO-RE-07].

The control measures considered for this activity are shown in Table 7-30 with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-30: Control measures evaluation for treated seawater discharge

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-48	NOPSEMA-accepted safety case.	Administrative	Includes control measures for pipeline integrity and management controls.	Costs associated with personnel time in writing, reviewing and implementing the safety case.	Adopted – Benefits considered to outweigh costs. Regulatory requirement must be adopted.
RE-CM-49	Inspection and corrosion monitoring.	Administrative	Regular inspections reduce the risk of leaks from DC supply pipeline by confirming appropriate integrity.	Costs associated with personnel time in performing the inspections, monitoring and reporting of inspections and follow-up actions.	Adopted – Benefits considered to outweigh costs.
RE-CM-15	Navigational charts	Administrative	Provides a means for marine users to be aware of the presence of the platform and subsea infrastructure.	Costs associated with personnel time in issuing notifications.	Adopted – Benefits considered to outweigh costs.
RE-CM-40	Dropped object prevention procedures.	Administrative	Impacts to environment are reduced by preventing	Costs associated with personnel time in implementing	Adopted – Benefits

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			dropped objects. Minimises drop risk during lifting operations. Requires lifting equipment to be certified and inspected.	procedures and in incident reporting.	considered to outweigh costs.
RE-CM-13	Anchoring and equipment deployment management.		Anchoring and placement of equipment is controlled through ensuring that any anchoring occurs at pre-approved locations, thereby reducing potential environmental impacts.	Costs associated with implementing procedures.	Adopted – Benefits considered to outweigh costs.
RE-CM-31	General chemical management procedures.	Administrative	Reduces potential for inappropriate discharge of water at sea, through appropriate handling, to maintain planned discharges to sea meet the criteria for not being harmful to the marine environment.	Personnel time associated with vessel inspection and implementation.	Adopted – Benefits of ensuring vessel is compliant outweigh the minimal costs of personnel time and it is a legislated requirement.
RE-CM-32	Chemical selection procedure.	Administrative	Aids in the process of chemical management that reduces the impact of flushing fluids to sea. Only environmentally acceptable products are used. Reduces the potential impacts to culturally significant marine species, including totemic species, such as marine turtles and marine mammals.	Cost associated with implementation of procedure. Range of chemicals reduced with potentially higher costs for alternative products.	Adopted – Environmental benefit of using lower toxicity chemicals outweigh procedural implementation costs.
RE-CM-34	Pipeline flushing prior to opening of the subsea system.	Engineering	Production fluids (hydrocarbons) will be flushed through with treated water to the DCGP prior to opening the system. Reduces the toxicity of chemicals and residual hydrocarbons in subsea infrastructure before any release to sea during activities.	Additional costs and time taken to flush DC supply pipeline.	Adopted – Environmental benefits of flushing outweigh the associated costs.
RE-CM-36	Calibrated dosing system in place to ensure accuracy of	Engineering	Santos temporary equipment assessment procedure (SO-91-IG-10050) ensures calibration and	Implementation of a procedure; cost of independent verification	Adopted – Benefits of ensuring correct chemical dosing maintains pipeline integrity

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
	chemical dosing		independent verification of temporary equipment used for chemical dosing of the treated seawater therefore managing potential impact to marine environment to acceptable levels		and reduces the potential environmental impact
RE-CM-37	Testing of pipeline preservation fluids	Engineering	Ensures pipeline integrity is maintained through testing for bacterial colonies in the pipeline contents which is an indicator for less of effectiveness of preservation. Maintaining pipeline integrity prevents loss to the marine environment	Cost of testing and implementing procedures	Adopted – Benefits of ensuring pipeline is effectively preserved maintains pipeline integrity and reduces the potential environmental impact
Additional Control Measures					
RE-CM-56	Pipeline is positively isolated at minimum pressure	Engineering	Positively isolating pipeline at minimum pressure reduced the volume of seawater that would be released in the event of a pipeline rupture.	Cost of implementing procedures	Adopted – Reducing the potential pipeline release volume reduces the potential environmental impact
RE-CM-57	Activate the relevant scientific monitoring plans as per the operational and scientific services arrangement in place in the OPEP	Protective	Scientific monitoring determines the extent and duration of the impact.	Cost of implementing water quality monitoring	Adopted –To determine extent and duration of impact.

7.9.4 Environmental impact assessment

Description- Unplanned Release of Treated Seawater	
Receptors	Threatened, migratory, or local fauna Protected areas Physical environment or habitats Socio-economic receptors
Consequence	I-Negligible

Threatened, migratory, or local fauna

Changes to water quality may result in an alteration to marine fauna behaviour. Sensitive receptors that may be impacted include fish at surface, marine turtles and mammals, and seabirds.

No physical environments or habitats are identified in the area over which treated seawater discharges are expected to disperse other than open water.

The CSB overlaps the following BIAs:

- The humpback whale migration BIA

Description- Unplanned Release of Treated Seawater	
• The flatback turtle internesting BIA • The green turtle nesting BIA • The hawksbill turtle nesting BIA • The wedge-tailed shearwater and roseate tern breeding BIAs Marine fauna species within the vicinity of the discharge location are likely to be transient. If discharge contact does occur with any marine fauna, it will be for a short duration due to the rapid dispersion of the plume and restriction to the surface waters only, and the transient fauna movement—exposure time may not be long enough to cause a toxic effect. Impacts will be temporary, and the area potentially impacted is small compared with the size of the areas used by the species. Therefore, no long-term impacts to the species are expected. No decrease in local population size, area of occupancy of species, loss or disruption of critical habitat or disruption to the breeding cycle of any of the protected matters species is expected. Any effects on water quality are expected to be highly localised and within the surface waters only and have little to no effect on seabed receptors. The consequence level for threatened migratory or local fauna is considered to be I-Negligible	
Physical environment or habitat Impacts to water quality that will be experienced in the discharge mixing zone will be localised and will occur only as long as the discharges occur (i.e. no sustained impacts); therefore, recovery will be measured in hours to days. Given highly dispersive waters of the open ocean environment and that the modelling results also indicate that the NOEC threshold will not be exceeded for more than 36 hours impacts will be limited to short-term water quality impacts. Given the temporary (36 hours) minor reduction in water quality, water depth and that the chemicals are inherently biodegradable with low potential for bioaccumulation, it is reasonable to conclude that no substantial change in the benthic communities and water quality is anticipated from the treated seawater discharges and therefore the impact is assessed as acceptable. The consequence level for physical environment or habitat is considered to be I-Negligible	
Threatened ecological communities Not applicable – No threatened ecological communities are identified in the area over which the treated seawater discharge will disperse.	
Protected areas Not applicable – No protected areas are identified in the area over which the treated seawater discharge will disperse.	
Socio-economic receptors There is limited activity by commercial fishers, recreation and tourism that overlap the operational area. Contact from the short-term discharge of treated seawater will be limited to transient fauna individuals where exposure time will unlikely cause a toxic effect. Given the negligible consequence to species, subsequent impacts to socioeconomic receptors are not anticipated. EP stakeholder consultation did not raise any concerns regarding potential impacts to cultural features including sea country. In addition, no stakeholder concerns have been raised regarding this event The consequence level for the socioeconomic receptors is considered to be I-Negligible	
Likelihood	A-Remote
A treated seawater release resulting from a DC supply pipeline rupture caused by an integrity or corrosion issue, dropped object or anchor drag is unlikely to have widespread ecological effects, given the composition of treated seawater, the safety design of the production system, the limited volumes that could be released, the water depth and the transient nature of marine fauna in this area. Deteriorating water quality is identified as a potential threat to turtles in the marine turtle recovery plan and to some bird and shark species (Table 3-10). Habitat modification, degradation, disruption, and loss are also identified as threats to sharks, birds, cetaceans and turtles in conservation management and recovery plans. However, the potential treated seawater releases as a result of DC supply pipeline rupture are not expected to significantly impact the receiving environment, given the management controls proposed. Additionally, long-term impacts resulting in complete habitat loss or degradation are not considered likely, given the controls proposed to prevent releases; therefore, the activity will be conducted in a manner that is considered acceptable. The likelihood of a treated seawater release occurring due to DC supply pipeline rupture is limited by the set of mitigation and management controls in place. Consequently, the likelihood of a DC supply pipeline rupture releasing treated seawater to the environment which results in a negligible consequence is considered to be A – *Remote*.	
Residual Risk	Very Low

7.9.5 Demonstration of ALARP

The use of chemicals to preserve pipelines is a standard technique that is considered critical in maintaining equipment integrity and preventing potential environmental incidents and is unavoidable for the activity. The use of treated seawater is an industry standard and uses chemicals that have been appropriately risk assessed under the Operations Chemical Selection Evaluation and Approval Procedure (EA 91 II 10001).

The volume of discharge will occur in a deep-water location with rapid dispersion. The modelling results also indicate that the NOEC will not be exceeded for more than 36 hours.

Applying a chemical selection process (see Section 2.11) is an important control measure for reducing the toxicity of discharges to the marine environment. Under the procedure, CHARM-rated gold/silver and non-CHARM Group E/D chemicals managed under the OCNS, or OSPAR PLONOR list, or chemicals risk assessed by Santos and deemed environmentally acceptable, will be selected.

The identified causes of DC supply pipeline rupture from external factors are through a loss of integrity, corrosion, dropped objects and anchor drag. A number of procedural controls are in place that reduce the likelihood of these events. Eliminating the potential from dropped objects and anchoring is not feasible since vessel activity is also inherent in the activities (e.g. inspection and maintenance activities using ROVs and divers)

The subsea DC supply pipeline is designed to reduce the potential for rupture and release of treated seawater to the marine environment. The integrity of the subsea production system is maintained through planned inspection, monitoring and testing of its components, ensuring that the system operates within its design requirements and that there is no unacceptable degradation of the system (e.g. materials, or ESD valve shutdown time or leakage).

During the CoP phase the pipeline has been cleaned of hydrocarbons, filled with treated seawater and positively at a minimum pressure. In the event of a pipeline rupture during the preservation phase, the pipeline has already been isolated from the subsea system. As the pipeline is a minimum pressure during the preservation phase, pressure equilibrium is reached earlier thus reducing the potential discharge volume.

The consequence was assessed as I-Negligible and cannot be reduced further. Additional control measures were considered but rejected since the associated cost or effort was grossly disproportionate to any benefit, as detailed in Section 7.9.3. Therefore, the impacts of treated seawater discharges are considered ALARP.

7.9.6 Acceptability evaluation

Is the risk ranked between Very Low and Medium?	Yes – residual risk is ranked Very Low.
Is further information required in the consequence assessment?	No – Potential impacts and risks are well understood through the information available.
Are risks and impacts consistent with the principles of ecologically sustainable development?	Yes – Activity evaluated in accordance with Santos' Environmental Hazard Identification and Assessment Procedure, which considers principles of ecologically sustainable development.
Are risks and impacts consistent with relevant legislation, international agreements and conventions, guidelines and codes of practice (including species recovery plans, threat abatement plans, conservation advice and Australian marine park zoning objectives)?	Yes – Consistent with relevant species recovery plans, conservation management plans and management actions set out in Table 3-10.
Are risks and impacts consistent with Santos Environment, Health & Safety Policy?	Yes – Aligns with Santos Environment, Health & Safety Policy.
Are risks and impacts consistent with stakeholder expectations?	Yes – No concerns raised by stakeholders for this event.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – See ALARP above.

The likelihood of a subsea treated seawater release from the DC supply pipeline is Remote when considering industry statistics, Santo's statistics and the preventive controls in place. Additional industry standard and activity-specific control measures to reduce the chance of the event occurring (and minimise impacts) have also been implemented, including (but not limited to) procedures such as the safety case, personnel training and awareness.

In accordance with Santos WA's risk assessment process, the residual risk is considered to be Very Low and ALARP. The proposed control measures will reduce the risk of impacts from a subsea DC supply pipeline treated seawater release to a level that is considered acceptable

7.10 Unplanned release of nitrogen

7.10.1 Description of event

Event	Once the Reindeer facilities reach the end of field life they will need to be flushed of hydrocarbons and preserved for future decommissioning or other uses. Following flushing of the pipeline to DCGP, the pipeline will be filled with treated seawater. Following flushing the pipeline may be re-preserved with treated seawater or an inert gas such as nitrogen. It is considered credible that an unplanned release of nitrogen could occur from the subsea DC supply pipeline during CoP (preservation) phase. The potential hazard sources that could cause an unplanned release of nitrogen from the DC supply pipeline include: • Internal/external corrosion • Anchor impact dragging • Loss of suspended load from a visiting vessel The maximum credible release is 124,618 kg of nitrogen gas (100% loss of containment). Since nitrogen gas is non-flammable and in a low volume, the primary concern would be the risk of asphyxiation marine environment due to the natural dilution from wind and water depth resulting in rapid dispersion. However, it is unlikely, given these effects are greatly diminished in the offshore release rate.
Extent	The subsea release from the DC supply pipeline spill scenario is credible anywhere along the DC supply pipeline in Commonwealth waters. The CSB has been used as the location for this release as it is closest to sensitive receptors. Nitrogen modelling undertaken for the Barossa Darwin Pipeline Duplication (DPD) EP was used to inform this risk assessment. The modelling results are highly conservative, as nitrogen release scenario in the Barossa DPD EP is 3,000 tonnes of nitrogen at a relatively low pressure between 10 and 35 bar. The nitrogen dispersion modelling (Add Energy, 2023) of the unplanned nitrogen release from the Barossa DPD EP for the worst-case release scenario (full bore rupture and calm conditions) predicted that a boil zone has the potential to extend up to 11 m diameter at the sea surface. Nitrogen gas cloud from the boil zone could result in reduced oxygen concentrations (Table 7-31). A 1.5% oxygen reduction may extend up to a height of 13.4 m and 335 m downwind. A 13% oxygen reduction may extend up to a height of 3.8 m and 93 m downwind. This impact extent is conservative as the release volume is used in the modelling 3,000 tonnes is significantly higher than the predicted release volume from the DC supply pipeline (124,618 kg).
Duration	Oxygen depletion will be limited to a very short period (within a few hours) immediately following the release. The maximum duration is based on the assumption of a 100% loss of containment.

Nitrogen Gas

Molecular nitrogen is a non-hazardous and non-combustible gas that is colourless, odourless, tasteless, and inert at normal temperatures and pressures (National Centre for Biotechnology Information, 2023). It constitutes ~78% of the Earth's atmosphere; in the ocean, more than 95% of nitrogen exists as gas (Royal Society, 2013). When released into the environment, nitrogen will rise through the water column (relative density of 0.97), forming a solution with the surrounding water. Rising gas bubbles generate turbulence at the surface when they break the sea surface. This is referred to as the 'boil zone' and is accompanied by a radial outflow of water which has been entrained in the plume. The nitrogen gas above the boil zone would disperse into the atmosphere in a buoyant plume, with the potential to form a gas cloud (Add Energy, 2023). High concentrations of nitrogen displace the oxygen in the air resulting in reduced oxygen atmospheres (Table 7-31). Asphyxiation in humans is associated with oxygen levels at 8% or less, or nitrogen concentrations of 620,000 ppm or greater (Add Energy, 2023).

Table 7-31: Oxygen levels associated with nitrogen concentration

Nitrogen concentration (ppm)	Oxygen level reduction (%)	Oxygen level (vol%)
71,000	1.5	19.5
520,000	11	10
620,000	13	8

Source: Add Energy, 2023

7.10.2 Nature and scale of environmental impacts

Potential receptors: physical environment (water and air quality); threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, other fish, and birds); socioeconomic (other marine users); and cultural features.

7.10.2.1 Physical environment

The seabed at the CSB is characterised by soft unconsolidated sediments (RPS, 2008). Benthic primary producer habitat (e.g. areas of hard corals, seagrass or macroalgae) is unlikely to be present in the operational area, given that the water depths range between ~38 and 58 m (NGI, 2018). Benthic primary production at these depths is limited due to insufficient light availability (RPS, 2008).

Any seabed disturbance impacts (e.g. scouring) are expected to be limited to the immediate vicinity of the DC supply pipeline rupture. Given the mobile nature of sediments and high current speeds, the seabed is expected to return to near its original state over time – no substantial changes to seabed features are anticipated.

A DC supply pipeline rupture and subsequent release of nitrogen gas potentially could result in a localised nitrogen gas plume that would dissipate within minutes. A nitrogen gas plume would move towards the surface and given the water depth would facilitate the dissolution of nitrogen in the water column as the plume rises. A worst-case rupture would lead to the formation of a minor gas cloud at the sea surface, which would rapidly disperse into the atmosphere (within minutes). This potential effect would be highly localised (within hundreds of metres) with a short duration and rapidly dispersed within the environment. Due to the limited volumes and expected rapid dispersal below ecological impact thresholds, impacts to physical environment are not expected.

7.10.2.2 Threatened, migratory or local fauna (marine mammals, marine reptiles, sharks and rays, other fish, and birds)

A gas cloud may potentially impact air-breathing fauna, such as marine mammals, reptiles, and birds. Air-breathing fauna in the immediate vicinity of the release may be at risk of asphyxiation, potentially resulting in death. Li et al (2021) and Galli et al. (2021) suggest that marine mammals and marine turtles have evolved to adapt to hypoxia, including changes in physiology, gene expression regulation and genetic mutations. However, there is limited research of the impacts of high concentrations of nitrogen on these species. The recovery plan for Marine Turtles in Australia 2017–2027 (CoA, 2017b) identified pollution as a threat. However, pollution sources were primarily related to agricultural, terrestrial industrial and domestic sources. The accidental gas release is expected to be of very short duration and highly localised extent with no persistence in the environment.

Sharks, rays and other fish exposed to high concentrations of nitrogen gas may be at risk of asphyxiation or gas bubble disease (formation of intravascular and extravascular systemic gas bubbles), potentially resulting in death or injury. Given that there are no fish aggregation sites in the vicinity of the release- impacts are limited to transiting individuals which are not considered to results in population level effects.

Given that the water depth would facilitate the dissolution of nitrogen in the water column and rapid gas dispersion into the atmosphere, the potential effect (injury to or death of an individual animal) would be highly localised (within hundreds of metres) with a short duration (within minutes). This unplanned event is not considered to have the potential for significant impacts to marine fauna species at the population level.

7.10.2.3 Socioeconomic

A nitrogen gas cloud at high concentrations (620,000 ppm) could cause asphyxiation to humans. The nitrogen dispersion modelling (Add Energy, 2023) for the worst-case release scenario (full bore rupture and calm conditions) predicted that the conditions resulting in asphyxiation to humans (≤8% oxygen level) may extend up to a height of 3.8 m and 93 m downwind and may fall outside of the minimum safe working limits (19.5% oxygen level) within a height of 13.4 m and 335 m downwind. A gas cloud could risk the health and safety of other users, such as fishers (traditional and commercial), tourism and recreational users. All other marine users will be excluded from the primary activity vessel 500 m safety exclusion zone; therefore, outside the predicted extent if an unplanned event occurs.

7.10.3 Environmental performance outcomes and control measures

The EPO relating to this event is:

- No unplanned objects, emissions or discharges to sea or air [EPO-RE-07].

The control measures considered for this activity are shown in Table 7-32 with EPSs and measurement criteria for the EPOs described in Table 8-2.

Table 7-32: Control measures evaluation for unplanned release: nitrogen gas

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
Standard Controls					
RE-CM-12	Planned subsea and offshore maintenance.	Administrative	Reduces likelihood of leaks from equipment and ensures ongoing integrity of subsea infrastructure.	Personnel and operational costs associated with undertaking regular inspections of all subsea equipment.	Adopted – Benefit of the inspection to determine operational integrity outweighs the cost to undertake the inspection.
RE-CM-48	NOPSEMA-accepted safety case.	Administrative	Includes control measures for pipeline integrity and management controls.	Costs associated with personnel time in writing, reviewing and implementing the safety case.	Adopted – Benefits considered to outweigh costs. Regulatory requirement must be adopted.
RE-CM-49	Inspection and corrosion monitoring.	Administrative	Regular inspections reduce the risk of leaks from DC supply pipeline by confirming appropriate integrity.	Costs associated with personnel time in performing the inspections, monitoring and reporting of inspections and follow-up actions.	Adopted – Benefits considered to outweigh costs.
RE-CM-15	Navigational charts	Administrative	Provides a means for marine users to be aware of the presence of the platform and subsea infrastructure.	Costs associated with personnel time in issuing notifications.	Adopted – Benefits considered to outweigh costs.
RE-CM-40	Dropped object prevention procedures.	Administrative	Impacts to environment are reduced by preventing dropped objects. Minimises drop risk during lifting operations. Requires lifting equipment to be certified and inspected.	Costs associated with personnel time in implementing procedures and in incident reporting.	Adopted – Benefits considered to outweigh costs.
RE-CM-13	Anchoring and equipment deployment management.		Anchoring and placement of equipment is controlled through ensuring that any anchoring occurs at pre-approved locations, thereby reducing potential environmental impacts.	Costs associated with implementing procedures.	Adopted – Benefits considered to outweigh costs.
RE-CM-34	Pipeline flushing prior to opening of the subsea system.	Engineering	Production fluids (hydrocarbons) will be flushed through with treated water to the DCGP prior to opening the system.	Additional costs and time taken to flush DC supply pipeline.	Adopted – Environmental benefits of flushing outweigh the associated costs.

Control Measure Ref. No.	Control Measure	Hierarchy of Control	Environmental Benefit	Potential Cost/Issues	Evaluation
			Reduces the toxicity of chemicals and residual hydrocarbons in subsea infrastructure before any release to sea during activities.		
Additional Control Measures					
N/A	Eliminate lifting in the operational area (elimination control)	Reduces the risk of dropped objects.	Lifting is an essential activity for installation activities.	**Rejected** – not feasible to eliminate lifting in the field.	N/A

7.10.4 Environmental impact assessment

Receptors	• Physical environment (water quality, air quality) • Threatened, migratory or local fauna (marine mammals, marine reptiles, sharks, rays, other fish, and birds) • Socioeconomic (commercial fishing, traditional fishing, tourism, recreation, shipping and defence) • Cultural features
Consequence	I – Negligible
Impacts to water and air quality would be expected, but due to the dispersive nature of the ocean environment and water depths, impacts are expected to be short-term and localised. The unplanned release is unlikely to have widespread ecological effects. Given that the water depth would facilitate the dissolution of nitrogen in the water column, rapid gas dispersion into the atmosphere and the transient nature of marine fauna in this area, the potential effect (injury to or death of an individual animal) would be highly localised (within a few metres) with a short duration (within minutes). This unplanned event is not considered to have the potential for significant impacts to marine fauna species at the population level. Potential impacts to the physical environment (water and air quality) and marine fauna are considered to be I – Negligible. Given the 500 m safety exclusion zone that will be in force around the primary activity vessel, subsequent impacts to socioeconomic receptors including commercial fishing and other marine users are not anticipated. For assessment of impacts to marine species of cultural significance, refer to the above paragraphs.	
Likelihood	A-Remote
Santos is unaware of any nitrogen release from a pipeline rupture caused by installation activities. A pipeline rupture incident caused by installation activities with the control measures in place is considered to be remote.	
Residual Risk	Very Low.

7.10.5 Demonstration of as low as reasonably practicable

The identified causes of DC supply pipeline rupture from external factors are through a loss of integrity, corrosion, dropped objects and anchor drag. A number of procedural controls are in place that reduce the likelihood of these events. Eliminating the potential from dropped objects and anchoring is not feasible since vessel activity is also inherent in the activities (e.g. inspection and maintenance activities using ROVs and divers)

The subsea DC supply pipeline is designed to reduce the potential for rupture and release of nitrogen to the marine environment. The integrity of the subsea production system is maintained through planned inspection, monitoring and testing of its components, ensuring that the system operates within its design requirements and that there is no unacceptable degradation of the system (e.g. materials, or ESD valve shutdown time or leakage).

During the CoP phase the pipeline has been cleaned of hydrocarbons, filled with treated seawater and positively at a minimum pressure. In the event of a pipeline rupture during the preservation phase, the pipeline has already been isolated from the subsea system. As the pipeline is a minimum pressure during the preservation phase, pressure equilibrium is reached earlier thus reducing the potential discharge volume.

The consequence was assessed as I-Negligible and cannot be reduced further. Additional control measures were considered but rejected since the associated cost or effort was grossly disproportionate to any benefit, as detailed in Section 7.10.3. Therefore, the impacts of treated seawater discharges are considered ALARP.

7.10.6 Acceptability evaluation

Is the risk ranked between Very Low and Medium?	Yes – residual risk is ranked Very Low.
Is further information required to validate the consequence assessment?	No – potential impacts and risks are well understood through the information available.
Are the risks and impacts consistent with the principles of ecologically sustainable development (ESD)?	Yes – activity evaluated in accordance with Santos' Offshore Division Environmental Hazard Identification and Assessment Guideline (EA-91-IG-00004), which considers principles of ESD.
Have the acceptable levels of impact and risks been informed by relevant species recovery plans, threat abatement plans and conservation advice and Australian marine park zoning objectives?	Yes – while several plans identify pollution as a threat to marine fauna, significant impacts are not predicted for this Activity.
Are performance outcomes, control measures and associated performance standards consistent with legal and regulatory requirements?	Yes – Relevant legislative requirements and standard industry practices have been applied to control the risk. Through acceptance of this EP, legislative and regulatory requirements will be met as per Section 1.8.
Are performance outcomes, control measures and associated performance standards consistent with Santos' Environment, Health and Safety Policy?	Yes – aligns with Santos' Environment, Health and Safety Policy (Appendix A).
Are performance outcomes, control measures and associated performance standards consistent with industry standards?	Yes – the most recent and comparable EPs accepted by NOPSEMA were reviewed for consistency with the performance outcomes, control measures and associated performance standards proposed in this EP.
Have performance outcomes, control measures and associated performance standards taken into consideration Relevant Person feedback?	Yes – no objections or claims were raised regarding a potential unplanned nitrogen gas release.
Are performance standards such that the impact or risk is considered to be ALARP?	Yes – ALARP assessment conducted, with additional control measures adopted.

No Relevant Persons concerns have been raised regarding this aspect, and the proposed controls will reduce the residual risk to Very Low and ALARP. Therefore, Santos considers the residual risk associated with the unplanned nitrogen gas release to be reduced to an acceptable level.

Santos

8. Implementation strategy

OPGGS(E)R 2023 Requirements
Regulation 22(1)
The environment plan must contain an implementation strategy for the activity in accordance with this section.

The specific measures and arrangements that will be implemented in the event of an oil pollution emergency are detailed within the oil pollution emergency plan (OPEP).

Stakeholder engagement is assessed separately for the requirements of the Reindeer activities. Ongoing stakeholder management strategies are discussed in Section 4.

8.1 Environmental management system

OPGGS(E)R 2023 Requirements
Regulation 22(2)
The implementation strategy must contain a description of the environmental management system for the activity, including specific measures to be used to ensure that, for the duration of the activity: a) the environmental impacts and risks of the activity continue to be identified and reduced to a level that is as low as reasonably practicable; and b) control measures detailed in the environment plan are effective in reducing the environmental impacts and risks of the activity to as low as reasonably practicable and an acceptable level; and c) environmental performance outcomes and environmental performance standards in the environment plan are being met.

The Santos Management System exists to support its ethical, professional and legal obligations to undertake work in a manner that does not cause harm to people or the environment. The Santos Management System is a framework of policies, standards, processes, procedures, tools and control measures that, when used together by a properly resourced and competent organisation, result in these outcomes:

- A common health, safety and environment approach is followed across the organisation
- HSE is proactively managed and maintained
- The mandatory requirements of HSE management are implemented and are auditable
- HSE management performance is measured, and corrective actions are taken
- Opportunities for improvement are recognised and implemented
- Workforce commitments are understood and demonstrated.

This implementation strategy is designed to meet the requirements of the EP to ensure that:

- Environmental impacts and risks continue to be identified for the duration of the activity and reduced to ALARP
- Control measures are effective in reducing environmental impacts and risks to ALARP and acceptable levels
- Environmental performance outcomes and standards set out in this EP are met
- Stakeholder consultation is maintained throughout the activity as appropriate.

8.2 Environment Health and Safety Policy

Santos Environment, Health & Safety Policy (Appendix A) clearly sets out Santos' strategic environmental objectives and the commitment of the management team to continuous environmental performance improvement. This EP has been prepared in accordance with the fundamentals of this policy. By accepting employment with Santos, each employee and contractor is made aware during the recruitment process that he or she is responsible for the application of this policy.

8.3 Hazard identification, risk and impact assessment and controls

Hazards and associated environmental risks and impacts for the proposed activities have been systematically identified and assessed in this EP (Sections 6 and 7). The control measures and environmental performance standards that will be implemented to manage the identified risks and impacts and the environmental performance outcomes that will be achieved are detailed in Section 8.4.

To ensure that environmental risks and impacts remain acceptable and ALARP during the activity and for the duration of this EP, hazards will continue to be identified, assessed and controlled as described in Document Management (Section 8.11) and audits and inspections (Section 8.12).

Any new, or proposed amendment to a control measure or environmental performance standard or outcome will be managed in accordance with the management of change procedure (Section 8.11.2).

Oil spill response control measures and environmental performance standards and outcomes are listed in the OPEP.

8.4 Environmental performance

OPGGS(E)R 2023 Requirements
Regulation 21(2). Environmental performance outcomes and standards
The environment plan must: a) set environmental performance standards for the control measures identified under paragraph (5)(c); and b) set out the environmental performance outcomes against which the performance of the titleholder in protecting the environment is to be measured; and c) include measurement criteria that the titleholder will use to determine whether each environmental performance outcome and environmental performance standard is being met.

To ensure environmental risks and impacts will be of an acceptable level, EPOs have been defined and are listed in Table 8-1 for planned activities and unplanned events, those relating to oil spill response are listed in the OPEP. These outcomes will be achieved by implementing the identified control measures to the defined environmental performance standards.

Table 8-1: Environmental performance outcomes (environment plan)

Reference	Environmental Performance Outcomes
EPO-RE-01	No injury or mortality to EPBC Act and WA Biodiversity Conservation Act 2016 listed marine fauna during activities.
EPO-RE-02	Reduce impacts to marine fauna from lighting on the WHP and vessels through limiting lighting to that required by safety and navigational lighting requirements.
EPO-RE-03	Reduce impacts to air and water quality from planned discharges and emissions from activities.
EPO-RE-04	Seabed disturbance is limited to planned activities and defined locations within the operational area.
EPO-RE-05	Reduce impacts on other marine users through the provision of information to relevant stakeholders such that they are able to plan for their activities and avoid unexpected interference.
EPO-RE-06	No introduction of marine pest species.
EPO-RE-07	No unplanned objects, emissions or discharges to sea or air
EPO-RE-08	No loss of containment of hydrocarbon to the marine environment.

8.4.1 Control measures and performance standards

The control measures that will be used to manage identified environmental impacts and risks and the associated statements of performance required of the control measure (i.e. environmental performance standards) are listed in Table 8-2. Measurement criteria outlining how compliance with the control measure and the expected environmental performance could be evidenced are also listed.

All control measures and Performance Standards and associated measurement criteria relating to preparedness and response operations contingency oil response operations are contained within the Devil Creek Pipeline and Reindeer WHP OPEP.

Table 8-2: Control measures, environmental performance standards and measurement criteria for the proposed activity (environment plan)

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Procedure for interacting with marine fauna	RE-CM-01	Vessels comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003), which ensures compliance with Part 8 of the EPBC Regulations 2000, which includes controls for minimising the risk of collision with marine fauna.	RE-CM-01-EPS-01	Completed vessel statement of conformance.	EPO-RE-01	6.1, 7.2
		Helicopter contractor procedures comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003), which ensures compliance with Part 8 of the Environment Protection and Biodiversity Conservation Regulations 2000, which includes controls for minimising interaction with marine fauna.	RE-CM-01-EPS-02	Helicopter contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003).	EPO-RE-01	6.1, 7.2
		Any vessels strike with cetaceans will be reported in the National Ship Strike Database.	RE-CM-01-EPS-03	Conformance checked on Santo's receipt of incident report	EPO-RE-01	6.1, 7.2
		UAVs comply with Santos' Protected Marine Fauna Interaction and Sighting Procedure (EA-91-11-00003) which includes controls for minimising the risk of interaction with marine fauna.	RE-CM-01-EPS-04	Contractor procedures align with Santos' Protected Marine Fauna Interaction and Sighting Procedure.	EPO-RE-01	6.1, 7.2
		Thruster guards are available for use on work class ROVs to help prevent ingress of small marine fauna into ROV thrusters. If marine fauna are being impacted and providing pilotage is not compromised, ROV thruster guards will be installed to prevent ingress of marine fauna into the thrusters.	RE-CM-01-EPS-05	Photographs of fitted thruster guards.	EPO-RE-01	6.1, 7.2
Vessels planned maintenance system (PMS) to maintain vessel DP, engines, and machinery	RE-CM-02	Documented maintenance program is in place for equipment on vessels that provides a status on the maintenance of equipment.	RE-CM-02-EPS-01	CMMS records.	EPO-RE-01 EPO-RE-03 EPO-RE-07	6.1, 6.3, 7.3
Bird management plan for offshore Reindeer Platform	RE-CM-03	Bird management plan implemented which describes the	RE-CM-03-EPS-01	Approved bird management plan	EPO-RE-01	6.1 6.2

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
(EA-00-RI-10191) implemented		• Types of bird management strategies that are installed, and those that are permitted to be installed • Roles and responsibilities including maintenance of equipment • Training and awareness required • Monitoring and reporting requirements • Bird deterrent performance indicators.			EPO-RE-02	
Prestart requirements (for survey equipment)	RE-CM-04	Prior to commencing start-up of geophysical survey equipment in-water, the following will be completed: • A trained crew member (refer Section 8.6) observing for marine mammals, whale sharks or turtles within 500 m of the vessel during daylight for 15 minutes prior to start-up (if no sightings, survey can commence) • If marine mammals, whale sharks or turtles are sighted within 500 m of the geophysical equipment prior to commencement of survey equipment, the operation will be delayed until the animal has moved at least 500 m away or 10 minutes has passed since the last sighting • Soft-start procedures enacted over 30 minutes (if equipment allows) • Night operations can commence if there were no more than 3 delays due to marine fauna in the preceding 24-hour period.	RE-CM-04-EPS-01	Geophysical survey checklist completed prior to survey equipment commencement to provide evidence that pre-start requirements were followed.	EPO-RE-01	6.1
Navigation lighting and aids	RE-CM-05	Navigational lighting and communication aids on offshore platforms are provided and inspected at frequencies outlined in PS-04 Navigational Aids (RE-00-RG-045), which manages the methods to alert marine vessels and aircraft of the position of the facility to minimise the potential for collision.	RE-CM-05-EPS-01	CMMS records.	EPO-RE-02 EPO-RE-05 EPO-RE-08	6.2, 6.5, 7.6, 7.8
		Vessel navigation lighting and equipment is compliant with COLREGS/Marine Orders 30: Prevention of Collisions, and with Marine Orders Part 21, Safety of Navigation and Emergency Arrangements.	RE-CM-05-EPS-02	Vessel inspection records.		
Premobilisation review and planning of lighting on support vessels and the WHP is undertaken prior to IMMR activities	RE-CM-06	Where an activity may require 24-hour lighting, a project execution plan, planning and inductions, will include a requirement to minimise external lighting where practicable during the activity	RE-CM-06-EPS-01	Copy of project execution plan includes requirements to minimise lighting where practicable.	EPO-RE-02	6.2

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Facilities planned maintenance system	RE-CM-07	Documented maintenance program is in place for equipment on facilities that provides a status on the maintenance of equipment.	RE-CM-07-EPS-01	CMMS records.	EPO-RE-03 EPO-RE-07	6.3, 7.3
Fuel oil quality	RE-CM-08	MARPOL-compliant fuel oil will be used during the activity.	RE-CM-08-EPS-01	Fuel bunkering records and/or relevant purchase records.	EPO-RE-03	6.3
		HFO and IFO will not be stored or used on vessels	RE-CM-08-EPS-02	Completed statement of conformance supplied by vessel contractors.		
International Air Pollution Prevention Certificate	RE-CM-09	Pursuant to MARPOL Annex VI, vessel(s) will maintain a current International Air Pollution Prevention Certificate as relevant to vessel class that measures to prevent ozone-depleting substance emissions and to reduce NOx, SOx and incineration emissions during the activity are in place.	RE-CM-09-EPS-01	Current International Air Pollution Prevention Certificate.	EPO-RE-03 EPO-RE-07	6.3, 6.7
Ozone-depleting substance handling procedures	RE-CM-10	Ozone-depleting substances managed in accordance with MARPOL Annex VI to reduce the risk of an accidental release of ozone-depleting substances to air.	RE-CM-10-EPS-01	Completed ozone-depleting substance record book or recording system.	EPO-RE-03	6.3
Waste incineration	RE-CM-11	Waste incineration managed in accordance with Marine Order 97.	RE-CM-11-EPS-01	Completed waste record book or recording system.	EPO-RE-03	6.3
Planned subsea and offshore maintenance	RE-CM-12	Detailed permits to work, risk assessments, and all supporting HSE procedures and documentation are prepared for subsea maintenance or inspection, repair and intervention activities, as outlined in the Santos Subsea Inspection Procedure (SO-35-IS-00001).	RE-CM-12-EPS-01	CMMS records.	EPO-RE-04 EPO-RE-07	6.4, 7.3, 7.4, 7.6, 7.7, 7.8
		Santos will maintain in good condition and repair all subsea structures that are, and all subsea equipment and other property that is used in connection with the Reindeer Operations to ensure Santos can meet obligations under s.572 of the OPGGS Act. This will be achieved through the application of Santos Subsea Inspection Procedure (SO-35-IS-00001). The procedure shall include a description of subsea inspection philosophies, procedures and reporting. Inspection finding reviews by technical authorities will	RE-CM-12-EPS-02	CMMS Records demonstrate ongoing inspection, and maintenance if required, on all subsea structures. Inspection reports.	EPO-RE-04 EPO-RE-07 EPO-RE-08	

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
		be used to determine the following requirements to inform next actions: • Detailed engineering assessments. • Detailed risk assessments. • Maintenance and remedial works. • Future inspection schedules. The procedure shall require inspection reviews to be documented and resultant actions to be tracked and completed.				
Anchoring and equipment deployment management	RE-CM-13	If anchoring or placement of equipment is required, vessels will anchor or place equipment on seabed in accordance with the Mooring Operations Procedure (QE-91-IT-10001)	RE-CM-13-EPS-01	Incident database records show no anchoring or placement of equipment occurred at non-approved locations.	EPO-RE-04 EPO-RE-08	6.4, 7.7
		Recovery of all deployed equipment	RE-CM-13-EPS-02	Equipment records show all deployed equipment is recovered.	EPO-RE-04	6.4
Existing (gazetted) PSZ established around the WHP location.	RE-CM-14	Gazetted 500 m PSZ around the WHP prevents vessels from getting too close and causing damage to equipment of either party.	RE-CM-14-EPS-01	Notice to Mariners placed with AHO outlining PSZ and timeframes of the activity.	EPO-RE-05 EPO-RE-08	6.5,7.6, 7.8
Navigational charts	RE-CM-15	The offshore facilities and subsea infrastructure are charted on Australian Hydrographic Service nautical charts.	RE-CM-15-EPS-01	Australian Hydrographic Service nautical charts show Santos' Reindeer facilities are charted.	EPO-RE-05 EPO-RE-08	6.5, 7.6, 7.7, 7.8
Seafarer certification	RE-CM-16	Vessel crew are trained and competent, in accordance with Flag State regulations, to navigate vessels and reduce interaction with other marine users.	RE-CM-16-EPS-01	Training records.	EPO-RE-05 EPO-RE-08	6.5, 7.8
Identification System	RE-CM-17	Vessels have an Automatic Identification System to aid in their detection at sea.	RE-CM-17-EPS-01	Completed inspection report or statement of	EPO-RE-05	6.5

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
				conformance supplied by vessel contractors		
Constant bridge watch	RE-CM-18	Competent crew shall maintain constant bridge-watch.	RE-CM-18-EPS-01	Bridge log or equivalent	EPO-RE-01 EPO-RE-05	6.5, 7.2
Maritime notices	RE-CM-19	Information provided to either AMSA, Department of Defence, AHO and/or nearest port authority on the timing of IMMR vessel activities on the pipeline so the maritime industry is aware of petroleum activities.	RE-CM-19-EPS-01	Transmittal records demonstrate notification of activity prior to the activity commencing	EPO-RE-05	6.5
Santos' stakeholder consultation strategy	RE-CM-20	All correspondence with external stakeholders is recorded.	RE-CM-20-EPS-01	Consultation records	EPO-RE-05	6.5
		Santos' consultation coordinator is contactable before, during and after completion of the planned activity to ensure stakeholder feedback is evaluated and considered during the operational activity phases.	RE-CM-20-EPS-02	Consultation coordination contact details made available to all relevant people in all correspondence.	EPO-RE-05	6.5
		Santos will not restrict commercial fishing access to the operational area and is committed to concurrent operations where safety of either vessel is not compromised.	RE-CM-20-EPS-03	Incident records show nil incidents of complaints of restrictions to commercial fishing access to the operational area, and show nil incidents of vessel safety being compromised by concurrent operations	EPO-RE-05	6.5
Safety Exclusion Zone established around vessels during work on the pipeline to reduce potential for collision or interference with other marine user activities	RE-CM-21	A 500 m safety exclusion zone is established around the primary vessels during the activity (outside of the gazetted WHP PSZ)	RE-CM-21-EPS-01	Notice to Mariners placed with AHO outlining PSZ and timeframes of the activity	EPO-RE-05	6.5

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Vessel personnel inductions	RE-CM-22	Induction materials reinforce to the Vessel Master the importance of marine communications in the event of any potential interactions with active commercial fishers.	RE-CM-22-EPS-01	Induction Records	EPO-RE-05	6.5
No fishing from support vessels	RE-CM-23	Personnel are prohibited from recreational fishing activities on vessels	RE-CM-23-EPS-01	Induction records confirm no fishing prohibition is communicated to all personnel	EPO-RE-05	6.5
Sewage system	RE-CM-24	Pursuant to MARPOL Annex VI, vessel(s) have a current International Sewage Pollution Prevention (ISPP) Certificate which certifies that required measures to reduce impacts from sewage disposal are in place (as applicable to vessel class).	RE-CM-24-EPS-01	Current International Sewage Pollution Prevention certificate.	EPO-RE-03	6.6
		Preventive maintenance on sewage treatment equipment is completed as scheduled.	RE-CM-24-EPS-02	Maintenance records.		
		Sewage from vessels is discharged or retained, in accordance with MARPOL Annex IV.	RE-CM-24-EPS-03	Records demonstrates that sewage was appropriately discharged or retained.		
Marine Assurance Standard	RE-CM-25	Vessels selected and on-boarded in accordance with the Offshore Marine Assurance Procedure (SO-91-ZH-10001) to ensure contracted vessels are operated, maintained and manned in accordance with industry standards (for example, Marine Orders) and regulatory requirements (this EP) and the relevant Santos procedures mentioned in this EP	RE-CM-25-EPS-01	Completed documentation in accordance with procedure.	EPO-RE-01 EPO-RE-02 EPO-RE-03 EPO-RE-04 EPO-RE-05 EPO-RE-06 EPO-RE-07 EPO-RE-08	6 and 7

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Oily mixture system	RE-CM-26	Oily mixtures (bilge water) only discharged to sea in accordance with MARPOL Annex I.	RE-CM-26-EPS-01	Oil record book.	EPO-RE-03	6.6
		Preventive maintenance on oil filtering equipment completed as scheduled.	RE-CM-26-EPS-02	Maintenance records.		
		Pursuant to MARPOL Annex I, vessel(s) will have an International Oil Pollution Prevention Certificate, which certifies that required measures to reduce impacts of planned oil discharges are in place (as applicable to vessel class).	RE-CM-26-EPS-03	Current International Oil Pollution Prevention Certificate.		
Offshore platform deck drain system and bunding	RE-CM-27	Preventive maintenance on deck drainage sump and associated equipment completed in accordance with Reindeer WHP Performance Standard Assurance Plan: PS-14 Bunding and Open Drains (RE-00-RG-00054).	RE-CM-27-EPS-01	CMMS records.	EPO-RE-03 EPO-RE-07	6.6, 6.7, 7.4
Waste (garbage) management procedure	RE-CM-28	Waste management procedure implemented to reduce the risk of unplanned release of waste to sea. The procedure includes standards for: • Bin types • Lids and covers • Waste segregation • Bin storage • Food waste.	RE-CM-28-EPS-01	Completed Santos Offshore Representative inspection checklist	EPO-RE-03 EPO-RE-07	6.6, 7.3
		Pursuant to MARPOL Annex V, placards displayed to notify personnel of waste disposal restrictions.	RE-CM-28-EPS-02	Completed Santos Offshore Representative inspection checklist		
		No waste (garbage) discharged to sea, unless the waste is food waste disposed in accordance with MARPOL Annex V.	RE-CM-28-EPS-03	Completed garbage disposal record book or recording system verified by Santos Offshore Representative Marine Assurance inspections		
		Garbage generated on offshore facilities will not be discharged to the marine environment.	RE-CM-28-EPS-04	Incident records.		

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Deck cleaning product selection	RE-CM-29	Deck cleaning products planned to be released to sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V.	RE-CM-29-EPS-01	Safety data sheet and product supplier supplementary data as required.	EPO-RE-03 EPO-RE-07	6.6 7.4
General chemical management procedures	RE-CM-30	Safety data sheet available for all chemicals to aid in the process of hazard identification and chemical management.	RE-CM-30-EPS-01	Contractor's routine inspection of the chemical storage/ SDSs verified by onsite inspection – by either Santos Offshore Representative or Marine Assurance Inspection	EPO-RE-03 EPO-RE-07	6.6, 6.7, 7.4
		Chemicals managed in accordance with the safety data sheet in relation to safe handling and storage, spill response and emergency procedures, and disposal considerations.	RE-CM-30-EPS-02	Contractor's chemical management procedures verified by onsite inspection – by either Santos Offshore Representative or Marine Assurance Inspection		
Maritime Dangerous Goods Code	RE-CM-31	Dangerous goods managed in accordance with the International Maritime Dangerous Goods Code to reduce the risk of an environmental incident, such as an accidental release to sea or unintended chemical reaction.	RE-CM-31-EPS-01	Completed Multimodal Dangerous Goods Form for OSV transfers	EPO-RE-03 EPO-RE-07	6.6, 7.4
				Completed inspection checklist		

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
Chemical selection procedure	RE-CM-32	Products with potential to be released to the sea meet the criteria for not being harmful to the marine environment according to MARPOL Annex V; or Gold/Silver/D or E rated through OCNS; or have a completed Santos ecotoxicological risk assessment so only environmentally acceptable products are used. The selection criteria for chemical preference through the risk assessment process as outlined Santos Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001) is low aquatic toxicity (e.g. EC50/LC50 > 100 mg/L), low bioaccumulation potential (e.g. Log Pow <3) and readily biodegradable (e.g. >60 in 28 days OECD 306).	RE-CM-32-EPS-01	Completed Santos risk assessments show chemicals selected are acceptable as per Santos Operations Chemical Selection, Evaluation and Approval Procedure (EA-91-II-10001).	EPO-RE-03 EPO-RE-07	6.6, 6.7, 7.4
Scupper plugs will be available for deployment in the event of a spill to prevent deck drainage.	RE-CM-33	Scupper plugs or equivalent deck drainage control measures available where hydrocarbons are stored and frequently handled.	RE-CM-33-EPS-01	Completed weekly inspection checklist demonstrates that scupper plugs are on board	EPO-RE-03 EPO-RE-07	6.6, 6.7, 7.4
Pipeline flushing prior to opening of the subsea system	RE-CM-34	Subsea system flushed to reduce hydrocarbon content prior to opening of the subsea system.	RE-CM-34-EPS-01	Completed operational records.	EPO-RE-03	6.7
Vessel spill response plan (SOPEP/SMPEP)	RE-CM-35	Vessels have current and implemented a SOPEP, or SMPEP, pursuant to MARPOL Annex I.	RE-CM-35-EPS-01	Approved SOPEP or SMPEP.	EPO-RE-03 EPO-RE-07 EPO-RE-08	6.7, 7.4, 7.8
		SOPEP or SMPEP spill response exercises conducted not less often than every three months to ensure personnel are prepared.	RE-CM-35-EPS-02	Spill exercise records or evidence of a spill exercise in an operational report.		
Calibrated chemical dosing system in place to ensure accuracy of chemical dosing	RE-CM-36	Correct calibration of chemical dosing system is confirmed in accordance with Santos temporary equipment assessment procedure (SO-91-IG-10050)	RE-CM-36-EPS-01	Project execution procedure	EPO-RE-03	6.7
Testing of pipeline preservation fluids	RE-CM-37	Pipeline preservation fluids will be checked every 6 months during the preservation period to ensure the effectiveness of the preservation fluid	RE-CM-37-EPS-01	Project execution procedure	EPO-RE-03	6.7
Implementation of the management controls in the Santos Invasive Marine Species Management Plan (IMSMP)	RE-CM-38	Vessels are managed to low risk in accordance with the Santos IMSMP (EA-00-RI-10172) and consistent with the IMO 2023 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species (Biofouling	RE-CM-38-EPS-01	Completed risk assessment demonstrating equipment and vessels are ‘low risk’.	EPO-RE-06	7.1

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
		Guidelines 2023) prior to movement or transit into or within the invasive marine species management zone, which requires: assessment of applicable vessels using the IMSMP risk assessment the management of immersible equipment to low risk.				
		Pursuant to the Biosecurity Act 2015 and Australian Ballast Water Management Requirements 2020, primary and support vessels carrying ballast water and engaged in international voyages shall manage ballast water so that marine pest species are not introduced.	RE-CM-38-EPS-02	Records show Ballast Water Management is implemented Completed ballast water record book or log is verified by Santos Offshore Representative.	EPO-RE-06	7.1
		Vessels receive entry clearance from DAWE (Seaports) as necessary (or as applicable to their location and movements).	RE-CM-38-EPS-03	Records show a complete Questionnaire for Biosecurity Exemptions for Biosecurity Control Determination issued to Seaports at least one month in advance where practicable	EPO-RE-06	7.1
Anti-foulant system	RE-CM-39	Anti-foulant systems are maintained in compliance with International Convention on the Control of Harmful Anti-Fouling Systems on Ships, where applicable.	RE-CM-39-EPS-01	Current International Anti-Fouling System Certificate.	EPO-RE-06	7.1
Dropped object prevention procedures	RE-CM-40	Vessel Safety Case and Implementation of the Santos WA Offshore Oil & Gas Assets Lifting Guidelines (7700-670-STN-0006) which includes the following control measures for dropped objects that reduce the risk of objects entering the marine environment: • Lifting equipment certification and inspection • Lifting crew competencies • Heavy-lift procedures • Preventive maintenance on cranes.	RE-CM-40-EPS-01	NOPSEMA-accepted Safety Case. Completed inspection checklist Details contained in incident documents	EPO-RE-07 EPO-RE-08	7.3, 7.7

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
		Lifting operations managed in accordance with Vessel work instructions or procedures.	RE-CM-40-EPS-02	Vessel work instructions or procedures.		
		Objects dropped overboard are recovered (if possible) to mitigate the environmental consequences from objects remaining in the marine environment, unless the environmental consequences are negligible, or safety risks are disproportionate to the environmental consequences.	RE-CM-40-EPS-03	Fate of dropped objects detailed in incident documents.		
Inspection of platform structures and hydrocarbon-containing equipment	RE-CM-41	Platform hydrocarbon-containing equipment meets inspection criteria and frequency as specified in PS-02 Hydrocarbon Containment: Hydrocarbon Containing Equipment (RE-00-RG-00043), which provides hydrocarbon pressure containment and to prevent the uncontrolled release of hydrocarbons	RE-CM-41-EPS-01	CMMS records.	EPO-RE-07 EPO-RE-08	7.4 7.6
		Structural integrity of offshore platforms meets inspection criteria and frequency as specified in PS-01 Structural Integrity (RE-00-RG-00042) to provide structural support for facilities.	RE-CM-41-EPS-02	CMMS records.		
		Inspection of topsides structural and miscellaneous equipment meets inspection criteria and frequency as specified in the Topside Inspection Procedure (7700-090-PRO-0009), which defines the philosophy, procedure and reporting requirements for topsides structural and miscellaneous equipment inspection of offshore fixed steel platforms and floating structures.	RE-CM-41-EPS-03	CMMS records.		
		Inspection of rigid hydrocarbon riser sections and wellhead conductors above sea level will meet the inspection criteria and frequency specified in the Topside Riser & Wellhead Conductor Inspection Procedure (7700-090-PRO-0008), which defines the inspection philosophy, procedure and reporting requirements for rigid hydrocarbon risers and wellhead conductors above LAT.	RE-CM-41-EPS-04	CMMS records.		
		Subsea assets will meet the inspection criteria and frequency specified in the Subsea Inspection Procedure (SO-35-IS-00001), the purpose of which is to describe the inspection philosophy, procedure and reporting requirements for Santos subsea assets.	RE-CM-41-EPS-05	CMMS records.		
Hazardous chemical management procedures	RE-CM-42	For hazardous chemicals, including hydrocarbons, the following standards apply to reduce the risk of an accidental release to sea: • Storage containers closed when the product is not being used	RE-CM-42-EPS-01	Contractor's routine inspection of the chemical storage/ SDSs verified by onsite inspection – by	EPO-RE-07 EPO-RE-08	7.4 7.8

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
		• Storage containers managed in a manner that provides for secondary containment in the event of a spill or leak • Storage containers labelled with the technical product name as per the safety data sheet • Spills and leaks to deck, excluding storage bunds and drip trays, immediately cleaned up • Storage bunds and drip trays do not contain free-flowing volumes of liquid • Spill response equipment readily available.		either Santos Offshore Representative or Marine Assurance Inspection. Contractor's chemical management procedures. Verified by onsite inspection – by either Santos Offshore Representative or Marine Assurance Inspection.		
Santos Refuelling and Chemical Transfer Standard (SO-91-IQ-00098)	RE-CM-43	Bunkering activities follow the requirements of the Santos Refuelling and Chemical Transfer Standard (SO-91-IQ-00098) which includes key requirements to prevent spills to the environment such as: • when bunkering activities can occur • roles and responsibilities • dry-break couplings and breakaway couplings used • bunkering activity communication requirements • bunker hose undergoes hydrostatic leak testing.	RE-CM-43-EPS-01	Completed bunkering checklist Spills details contained in incident documentation.	EPO-RE-07 EPO-RE-08	7.4, 7.8
Spill response equipment on producing platforms	RE-CM-44	Spill response equipment is present on producing offshore platforms to contain and recover spills, thereby reducing potential for spills to reach the marine environment.	RE-CM-44-EPS-01	Audit records. Inspection records.	EPO-RE-07 EPO-RE-08	7.4, 7.8
Remotely operated vehicle inspection and maintenance procedures	RE-CM-45	Preventive maintenance on ROV completed as scheduled to reduce the risk of hydraulic fluid releases to sea.	RE-CM-45-EPS-01	Maintenance records or evidence of maintenance in operational reports.	EPO-RE-07	7.4
		ROV pre-deployment inspection completed to reduce the risk of hydraulic fluid releases to sea.	RE-CM-45-EPS-02	Completed inspection checklist. .		

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
NOPSEMA-accepted WOMP for Reindeer wells	RE-CM-46	An accepted WOMP for Reindeer wells is in place to specifically manage the risks associated with operation and management of these wells (including well intervention and maintenance activities). WOMP includes control measures to manage well integrity risks to ALARP including: • Minimum of two barrier envelopes • Certified pressure control equipment • Certified pumping package (including hoses and pipework) • Minimum requirements for pressure testing operations.	RE-CM-46-EPS-01	NOPSEMA accepted WOMP Incident records confirm no breach of containment.	EPO-RE-08	7.8
Well services procedures and criteria	RE-CM-47	Santos Integrity Management Procedure (SMS-OES-OS03-PD01) complied with, which includes the framework of policies, procedures, and performance standards for production operation assets.	RE-CM-47-EPS-01	Certification and test records confirm compliance with project-specific procedures and Santos Integrity Management Procedure (SMS-OES-OS03-PD01)	EPO-RE-08	7.6
		Well acceptance criteria for critical well operations and integrity aspects are achieved. Well acceptance criteria will be selected based on the well objectives and Santos Offshore Drilling and Completions technical standards.	RE-CM-47-EPS-02	Completed well acceptance criteria in well program. Incident records confirm no breach of containment.		
NOPSEMA-accepted safety case	RE-CM-48	A NOPSEMA-accepted safety case for all licensed pipelines is in place to specifically manage the risks associated with operation and integrity, including maintenance activities.	RE-CM-48-EPS-01	NOPSEMA-accepted safety case.	EPO-RE-08	7.6, 7.7
Inspection and corrosion monitoring	RE-CM-49	Offshore DC supply pipeline and risers meet inspection and monitoring criteria and frequency as outlined in PS-03 Hydrocarbon Containment; Risers and Pipelines (RE-00-RG-00044), which manages the inherent safety of risers and pipelines, including all mounted fittings, fixtures and supports.	RE-CM-49-EPS-01	CMMS records.	EPO-RE-08	7.6, 7.7
Testing and maintenance of emergency shutdown systems and shutdown/safety valves	RE-CM-50	Emergency shutdown systems and shutdown/safety valves are routinely tested and maintained to ensure integrity and function is maintained. Their testing criteria and test frequency are specified in:	RE-CM-50-EPS-02	CMMS Records	EPO-RE-08	7.6, 7.7

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
		• PS-06 ESD and Blowdown: Emergency Shutdown Valves (RE-00-RG-00047), which prevents the escalation of events by isolating the process plant and/or utility equipment • PS-07 ESD and Blowdown: Reservoir Isolation (including Surface-controlled Subsurface Safety Valves and Christmas Tree Valves) (RE-00-RG-00048), which applies to surface-controlled subsurface safety valves, Christmas tree valves and wellhead control panel to isolate the well inventories • PS-08 ESD and Blowdown: Safety Instrumented Systems (RE-00-RG-00049), which applies to the logic solver modules holding the safety logic • PS-10 ESD and Blowdown: Pressure Safety Valves (RE-00-RG-00050), which applies to all pressure safety valves on pressure-containing equipment and pipework to prevent a loss of containment from equipment and piping by controlled disposal via the flare systems or an alternative safe location.				
Accepted oil pollution emergency plan (OPEP)	RE-CM-51	In the event of an oil spill to sea, the Santos OPEP requirements implemented to mitigate environmental impacts.	RE-CM-51-EPS-01	Completed incident documentation.	EPO-RE-08	7.6, 7.7, 7.8
Support vessel positioning	RE-CM-52	As per NOPSEMA-accepted safety case requirements, support vessels will maintain a 'drift-off' position relative to offshore platforms to reduce potential for impact.	RE-CM-52-EPS-01	Completed vessel positioning logs.	EPO-RE-08	7.6, 7.7, 7.8
		If support vessels are using dynamic positioning, the dynamic positioning system is specified as per the relevant safety case's requirements.	RE-CM-52-EPS-02	NOPSEMA-accepted safety case.		
Emergency power system is provided on Reindeer WHP to secure secondary power source for safety integrity system	RE-CM-53	Uninterruptible power supply meets test and inspection criteria and test and inspection frequency as specified in PS-18 Emergency Power (RE-00-RG-00055).	RE-CM-53-EPS-01	CMMS records.	EPO-RE-08	7.6, 7.7, 7.8
Emergency response plan detailing the requirements for preparedness and response to emergencies and crises to protect people and the environment.	RE-CM-54	In the event that the integrity of a pipeline/valve is compromised or there is an unplanned hydrocarbon release from the DC supply Pipeline the Devil Creek Emergency Response Plan (DC-40-IF-00096) is initiated to activate the Isolation of the flowline/ pipeline/ wells.	RE-CM-54-EPS-01	Devil Creek Emergency Response Plan (DC-40-IF-00096) CMMS records.	EPO-RE-08	7.6, 7.7, 7.7
Water quality monitoring at discharge location to	RE-CM-55	A water quality monitoring will be undertaken at the discharge location prior to completion of discharge to confirm the	RE-CM-55-EPS-01	Water quality monitoring records	EPO-RE-03	6.8

Control Measure	Control Measure Ref. No.	Environmental Performance Standard	EPS Reference No.	Measurement Criteria	EPO Reference (Table 8-1)	Relevant Section of this EP
confirm the concentration of chemicals. A water quality monitoring program will also be developed to verify modelling outputs		concentration of chemical. A water quality monitoring program will also be developed to verify modelling outputs.		and water quality monitoring program.		
Pipeline is positively isolated at minimum pressure	RE-CM-56	Pipeline is positively isolated in accordance with the Isolation manual 1541-012-WPR-0039 and kept at minimum pressure.	RE-CM-56-EPS-01	CMMS records	EPO-RE-07	7.9
Activate the relevant scientific monitoring plans as per the operational and scientific services arrangement in place in the OPEP	RE-CM-57	In the event that the integrity of a pipeline/valve is compromised or there is an unplanned release of treated seawater from the DC supply pipeline, the scientific monitoring plans will be activated as per arrangements in the Devil Creek Pipeline and WHP OPEP.	RE-CM-57-EPS-01	Devil Creek Pipeline and WHP OPEP. CMMS records	EPO-RE-07	7.9

8.5 Roles and Responsibilities

OPGGS(E)R 2023 Requirements
Regulation 22(3)
The implementation strategy must establish a clear chain of command, setting out the roles and responsibilities of employees and contractors in relation to the implementation, management and review of the environment plan, including during emergencies or potential emergencies.

While the Santos Chief Executive Officer (CEO) has the overall accountability for the implementation of the Santos Management System and Santos Environment Health and Safety Policy, the Reindeer facility asset sits under the remit of the Executive Vice President of WA, Northern Australia, Timor Leste Business Unit. The Production Manager VI/DC is accountable for ensuring implementation, management, and review of this cessation of production EP.

Key roles and environmental responsibilities for this activity are outlined in

Table 8-3 and will be communicated to these positions before the activity commences and when any changes are made to these positions.

Table 8-3: Chain of command, key leadership roles and responsibilities

Role	Responsibilities
During all activities	
VP – Offshore Production	Has overall responsibility for: • Complying with the EP and Santos policies and procedures • Approving budgets to meet EP commitments • Ensuring accurate reporting of environmental incidents • Ensuring company has contractual provisions in place to enable rapid response to oil spill incidents.
Production Manager – VI/DC	Has overall responsibility for: • Implementing the EP and Santos policies and procedures • Ensuring the appropriate level of budget and planning is in place to meet EP commitments • Ensuring appropriate checks completed prior to mobilising support vessels • Approving Environmental MoC documents • Ensuring environmental incidents are appropriately investigated • Applying appropriate enforcement mechanisms to prevent breaches of this EP.
Operations Superintendent	Has responsibility for: • Ensuring that all relevant plans, commitments and procedures are available to personnel • Implementing the CMMS • Ensuring appropriate level of risk assessment has been completed • Approving procedures and work instructions • Developing resourcing plans • Interfacing between onshore and offshore teams.
GM Projects and Decommissioning-during COP phase only	Has overall responsibility for: • Complying with the EP and Santos policies and procedures • Compliance with Decommissioning strategy • Planning decommissioning contracting and execution strategy • Approving resources to meet decommissioning requirements.
Offshore Installation Manager (OIM)-Operations only	Has responsibility for: • Implementing EP commitments • Ensuring personnel competency • Ensuring compliance with procedures and work instructions • Providing the site focal point for onshore/offshore communications • Approving vessels entering the field

Role	Responsibilities
	• Reporting all incidents and potential hazards • Leading site-based incident response • Implementing corrective actions arising from environmental incidents and audits.
Manager – Engineering WA NA & TL	Has overall responsibility for: • Implementing subsea maintenance and integrity programme • Providing engineering support to the activities • Providing technical assurance.
HSS Manager WA NA & TL	Has overall responsibility for: • Ensuring incident preparedness and response arrangements meet Santos and regulatory requirements • Approving the OPEP; and • Providing ongoing resources to maintain compliance with the OPEP and other Santos incident response requirements.
HS Team Lead	Has overall responsibility for: • Overarching incident and crisis management responsibility • Manage the CMT and IMT personnel training program • Review and assess competencies for CMT, IMT, and field based IRT members • Manage the Duty roster system for CMT and IMT personnel • Manage the maintenance and readiness of incident response resources and equipment.
Environment Manager (WA, NA, TL)	• Ensure incident preparedness and response arrangements meet Santos and regulatory requirements; • Ensure adequate resources are in place to meet the compliance requirements within the OPEP; • Have overall responsibility for approving the OPEP; • Ensure adequate resources are in place to meet environment compliance requirements within the EP • Provide support and advice to the Environment Coordinator (Compliance) as needed • Notify NOPSEMA of a change in titleholder, a change in the titleholder's nominated liaison person or a change in the contact details for (as per Section 1.6).
Santos Environmental Coordinator (Compliance)	• Ensure site environmental audits are carried out as required to ensure compliance; • Ensure environmental monitoring is conducted in accordance with the Santos Management System and this EP; • Liaise with the Santos Production Manager and Offshore Site Representative to ensure compliance with all aspects of this EP; • Perform environmental education and inductions for operational personnel; • Ensure incident investigations are conducted as per Santos Management System; and • Ensure EP compliance report that covers environmental performance of the activity in this EP is prepared and submitted to NOPSEMA.
Senior Stakeholder Adviser / Relevant Persons Coordinator	• Responsible for implementation of steps described in Section 8.13 • relating to post acceptance consultation throughout the duration of the Activity • Maintains a Relevant Persons contact and information database • Maintains a Relevant Persons Notification Log specific to the EP • Maintains records of all Relevant Persons correspondence specific to the EP • Ensures relevant stakeholders are identified throughout the life of the EP • Prior to commencement of the activity and on advice of Environment Manager, WA, NA, TL , provides a notification to all relevant stakeholders listed, or as revised, in Table 8-4 The notification will include information on activity timing, vessel movements and vessel details; • On advice of Santos Environmental Coordinator (Compliance), provide cessation notifications to relevant stakeholders identified in Table 8-4 • Is available before, during and after the activity to ensure opportunities for stakeholders to provide feedback are available; and • Prepares and distributes quarterly consultation updates to relevant stakeholders.

Role	Responsibilities
Senior Oil Spill Response Advisor	Has overall responsibility for: • Provides upfront and ongoing guidance, framework, and direction on preparation of this OPEP • Develops and maintains arrangements and contracts for incident response support from 3rd-parties • Develops and define objectives, strategies and tactical plans for response preparedness defined in this OPEP and IRP • Undertaking assurance activities on arrangements outlined within the OPEP.
Support Vessel Master(s)	Have overall responsibility for: • Implementing and ensuring compliance with relevant environmental legislative requirements, EP commitments and operational procedures on the support vessel • Maintaining clear communication with the crew and passengers • Communicating hazards and risks to the workforce • Monitoring daily activities on the vessel to ensure that the relevant environmental legislative requirements, EP commitments and operational procedures are being followed • Maintaining their vessels to all regulatory and class requirements • Maintaining their vessel in a state of preparedness for emergency response • Reporting environmental incidents to the Person in Charge and ensuring follow-up actions are carried out.

8.6 Workforce training and competency

OPGGS(E)R 2023 Requirements
Regulation 22(4)
The implementation strategy must include measures to ensure that each employee or contractor working on, or in connection with, the activity is aware of the employee's or contractor's responsibilities in relation to the environment plan, including during emergencies or potential emergencies, and has the appropriate competencies and training.

8.6.1 Inductions

All personnel that arrive on the facilities and crew on support vessels will complete an induction that will include a component addressing their EP responsibilities. Induction attendance records for all personnel will be maintained. Inductions will include information on:

- Environmental Management Policy
- Regulatory regime (NOPSEMA regulations)
- Operating environment (e.g. nearby protected marine areas, sensitive environmental periods)
- Activities with highest risk (e.g. invasive marine species and hydrocarbon releases)
- EP commitments
- Incident reporting and notifications
- Regulatory compliance reporting
- Management of change process for changes to EP activities
- Oil pollution emergency response (e.g. OPEP requirements).

8.6.2 Training and competency

All members of the workforce on the WHP or support vessels will complete relevant training and/or hold relevant qualifications and certificates for their role. Santos and its contractors (e.g. support vessels, technical service providers) are individually responsible for ensuring their personnel are qualified and trained. The systems, procedures and responsible persons will vary and will be managed through the use of online databases, staff on-boarding process, training departments, etc.

Personnel qualification and training records will be sampled at various times such as during the procurement process, inductions, crew change, and operational inspections and audits.

8.6.3 Workforce involvement, ongoing training and communication

Daily operational meetings will be held offshore at which HSE will be a standing agenda item. It is a requirement that supervisors attend daily operational meetings and that all personnel attend daily toolbox or pre-shift meetings.

Toolbox or pre-shift meetings will be regularly held offshore to plan jobs and discuss work tasks, including HSE risks and controls.

HSE performance will be monitored and reported during the activity, and performance metrics (such as the number of environmental incidents) will be regularly communicated to the workforce. Workforce involvement and environmental awareness will also be promoted by encouraging offshore personnel to report marine fauna sightings and marine pollution (e.g. oil on water, dropped objects).

8.7 Maintenance management system

Santos uses a Computerised Maintenance Management System (CMMS) for offshore and onshore plant inspection. The planned maintenance management procedures are also supported by the Maintenance Management System. The objective of the Maintenance Management System is to ensure that the plant and associated equipment are fit for purpose, are safe to operate and are environmentally compliant for the life of the asset.

In addition to the scheduling of routine maintenance activities and inventory control, the Santos' Computer Maintenance Management System (CMMS) provides the information required to determine risk- or criticality-based maintenance requirements. This analysis matches the maintenance and inspection type and frequency to the criticality of the equipment and also allows efforts to be prioritised in the areas most critical for safety, environment, compliance and production. This results in effective and efficient practices to maximise reliability and availability of the plant. For each individual plant and facility, a preventive maintenance plan is incorporated into the CMMS. The preventive maintenance plan includes:

- All routine inspections
- All statutory inspections
- All maintenance carried out on a usage basis such as machine running hours.

8.8 Emergency preparedness and response

OPGGS(E)R 2023 Requirements
Regulation 22(8)
The implementation strategy must contain an oil pollution emergency plan and provide for the updating of the plan.

Vessels are required to have and implement incident response plans, such as an emergency response plan and SMPEP or SOPEP. Regular incident response drills and exercises (e.g. as defined in emergency response plan, SMPEP or SOPEP) will be carried out on support vessels to refresh the crew in using equipment and implementing incident response procedures.

Santos will implement the Reindeer and Devil Creek Oil Pollution Emergency Plan (EA-14-RI-10001.02) in the event of hydrocarbon spill. The OPEP details how Santos will prepare and respond to a spill event and meets the requirement of Regulation 22(8).

8.9 Incident reporting, investigation and follow-up

OPGGSR 2023 Requirements
Regulation 22(6)
The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and environmental performance standards in the environment plan are being met.
Regulation 22(7)
The implementation strategy must state when the titleholder will report to NOPSEMA in relation to the titleholder's environmental performance for the activity. The interval between reports must not be more than 12 months. Note: Section 51 requires a titleholder to report on environmental performance at the times or intervals set out in the environment plan.

All personnel will be informed through inductions and daily operational meetings of their duty to report HSE incidents and hazards. Reported HSE incidents and hazards will be shared during daily operational meetings, and HSE incidents and hazards will be documented in the incident management systems as appropriate. HSE incidents are investigated and reported in accordance with the Santos Incident Reporting, Investigation and Learning Procedure SMS-HSS-OS07-PD01 which uses root cause analysis.

Environmental recordable and reportable incidents will be reported to NOPSEMA, and other regulators as required, in accordance with Section 8.10.The incident reporting requirements will be provided to all crew on board the facilities and support vessels with special attention to the reporting time frames to provide for accurate and timely reporting.

For the purposes of this activity, in accordance with OPGGS(E)R 2023:

- A recordable incident, for an activity, means a breach of an environmental performance outcome or environmental performance standard, in the environment plan that applies to the activity, that is not a reportable incident
- A reportable incident, for an activity, means an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage.

For the purposes of this EP, a reportable incident is an incident that is assessed to have an environmental consequence of moderate or higher in accordance with Santos' environmental impact and risk assessment process outlined in Section 4.3. Of the planned and unplanned events assessed within this EP, the following were identified to have a potential consequence level of Moderate or higher if the event were to occur and would therefore be a reportable incident:

- introduction of invasive marine species (Major).
- hydrocarbon release from LOWC (Moderate).
- Surface release of diesel (Moderate).

8.10 Reporting and notifications

OPGGS(E)R 2023 Requirements
Regulation 22(6)
The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and environmental performance standards in the environment plan are being met.
Regulation 22(7)
The implementation strategy must state when the titleholder will report to the Regulator in relation to the titleholder's environmental performance for the activity. The interval between reports will not be more than 12 months.

8.10.1 Notifications and compliance reporting

Regulatory, other notification requirements, and compliance reporting requirements are summarised in Table 8-4.

Table 8-4: Activity notification and reporting requirements

Initiation	Required Information	Timing	Type	Recipient
Before the Activity				
OPGGS(E) Regulation 54 & 55 – Notifications	NOPSEMA must be notified that the activity is to commence	At least ten days before the campaign activity commences.	Written	NOPSEMA
Department of Defence Standing arrangement with DoD	Activity timing, location, description, and vessel contact details. Confirm restricted air space status.	At least five weeks before the activity commences where practicable.	Written	DoD: offshore.petroleum@defence.gov.au
AFMA Standing arrangement with AFMA	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	AFMA: petroleum@afma.gov.au
DEMIRS Standing arrangement with DEMIRS.	Activity timing, location, description, and vessel contact details.	At least ten days before the activity commences where practicable.	Written	DEMIRS
DAFF Standing arrangement with DAFF	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	DAFF: Petroleum&Fisheries@agriculture.gov.au
DPIRD	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	DPIRD:Environment@dpird.wa.gov.au
Recfishwest As requested during consultation	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	RecFishWest: info@recfishwest.org.au
AMSA JRCC Standing arrangement with AMSA JRCC.	Notification to AMSA's JRCC of proposed start and end dates and any other relevant information for the Notice to Mariners to be issued. AMSA's JRCC requires the: • vessel details (including name, callsign and Maritime Mobile Service Identity)	24–48 hours before the activity commences.	Written	AMSA's JRCC: rccaus@amsa.gov.au

Initiation	Required Information	Timing	Type	Recipient
	• satellite communications details (including INMARSAT-C and satellite telephone numbers) • area of operation • requested clearance from other vessels • any other information that may contribute to safety at sea • when operations start and end. This reporting will be performed prior to the start of the CoP campaigns.			
AHO Notification Standing arrangement with AHO	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	AHO: datacentre@hydro.gov.au
WAFIC Standing arrangement with WAFIC	Activity timing, location, description, and vessel contact details.	At least four weeks before the activity commences where practicable.	Written	WAFIC: oilandgas@wafic.org.au
Tuna Australia This is a standing arrangement with TA.	Activity timing, location, description, and vessel contact details.	24 to 48 hours before the activity commences.	Written	Contact details as provided by Tuna Australia
During the Activity				
AHO Notification Standing arrangement with AHO.	Any changes to the intended operations.	As soon as practicable.	Written	AHO: datacentre@hydro.gov.au
Australian Marine Mammal Centre Reporting Any ship strike incident with cetaceans will also be reported to the National Ship Strike database.	Ship strike report provided to the Australian Marine Mammal Centre: https://data.marinemammals.gov.au/report/shipstrike.	As soon as practicable.	Written	DCCEEW

Initiation	Required Information	Timing	Type	Recipient
AMSA Reporting Under the MoU between Santos and AMSA and as requested by AMSA during consultation.	Any changes to the intended operations.	As soon as practicable.	Written	AMSA's JRCC: rccaus@amsa.gov.au
	Titleholder agrees to notify AMSA of any marine pollution incident [1].	Within two hours of incident.	Oral	AMSA
	POLREP and SITREP available online (refer to OPEP).	POLREP as requested by AMSA following verbal notification. SITREP as requested by AMSA within 24 hours of request.	Written	AMSA
BTAC Requested during consultation	Notification of spill heading towards relevant parties' interests	Within twelve hours of incident being identified	As soon as practicable	BTAC
Department of Biodiversity, Conservation and Attractions Reporting Any harm or mortality to fauna listed as threatened under the WA *Biodiversity Conservation Act 2016*.	Notification of any harm or mortality to fauna listed as a threatened species under the WA *Biodiversity Conservation Act 2016* as a result of Santos' activities.	A fauna report will be submitted to DBCA within seven days to fauna@dbca.wa.gov.au.	Written	DBCA
Department of Biodiversity, Conservation and Attractions Reporting Notification of the event of a hydrocarbon release.	Notification of actual or impending spillage.	As soon as practicable.	Oral or written	DBCA Pilbara regional office
DCCEEW Reporting Any harm or mortality to EPBC Act listed	Notification of any harm or mortality to an EPBC listed species of marine fauna whether attributable to the activity or not.	Within seven days to EPBC.permits@environment.gov.au	Written	DCCEEW
	Marine fauna sighting data recorded in the marine fauna sighting database.	As soon as practicable, in any case no later than three months of the end of the activity.	Written	DCCEEW

Initiation	Required Information	Timing	Type	Recipient
threatened marine fauna. Marine Fauna Sighting Data.				
DPIRD Reporting If marine pests or disease are suspected this must be reported to DPIRD.	Notification of any suspected marine pests or diseases including any organism listed in the Western Australian Prevention List for Introduced Marine Pests and any other non-endemic organism that demonstrates invasive characteristics.	Within 24 hours.	Oral	DPIRD FishWatch
Department of Transport Reporting All actual or impending MOP incidents that are in, or may impact, State waters resulting from an offshore activity.	Notification of actual or impending spillage, release or escape of oil or an oily mixture that is capable of causing loss of life, injury to a person or damage to the health of a person, property or the environment.	Within two hours.	Oral	DoT
	WA DoT POLREP and SITREP available online (refer OPEP).	As requested by DoT after verbal notification.	Written	DoT
Director of National Parks Reporting Notification of the event of oil pollution within a marine park or where an oil spill response action must be taken within a marine park; or if any changes to intended operations (requested	The 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. Notification should be provided to the 24-hour Marine Compliance Duty Officer on 0419 293 465. The notification should include: • titleholder details • time and location of the incident (including name of marine park likely to be affected) • proposed response arrangements as per the OPEP (such as dispersant, containment) • confirmation of providing access to relevant monitoring and evaluation reports when available • contact details for the response coordinator.	So far as reasonably practicable prior to response action being written.	Oral and written	Director of National Parks

Initiation	Required Information	Timing	Type	Recipient
through consultation).	Note that the DNP may request daily or weekly Situation Reports, depending on the scale and severity of the pollution incident.			
	Notify if details regarding the activity change and result in an overlap with or new impact to a marine park.	As soon as practicable.	Written	DNP: marineparks@awe.gov.au
OPGGS(E) Regulation 24(c), 47 & 48 – Reportable Incident NOPSEMA must be notified of any reportable incidents. For the purposes of Regulation 24(c), a reportable incident is defined as: an incident relating to the activity that has caused, or has the potential to cause, moderate to significant environmental damage.	The oral notification must contain: • all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out. • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident. • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident.	As soon as practicable, and in any case not later than two hours after the first occurrence of a reportable incident, or if the incident was not detected at the time of the first occurrence, at the time of becoming aware of the reportable incident.	Oral	NOPSEMA
	A written record of the oral notification must be submitted. The written record is not required to include anything that was not included in the oral notification.	As soon as practicable after the oral notification.	Written	NOPSEMA National Offshore Petroleum Titles Administrator
	A written report must contain: • all material facts and circumstances concerning the reportable incident known or by reasonable search or enquiry could be found out • any action taken to avoid or mitigate any adverse environmental impacts of the reportable incident • the corrective action that has been taken, or is proposed to be taken, to stop, control or remedy the reportable incident • the action that has been taken, or is proposed to be taken, to prevent a similar incident occurring in the future. Consider reporting using NOPSEMA's Report of an Accident, Dangerous Occurrence or Environmental Incident form.	Must be submitted as soon as practicable, and in any case not later than three days after the first occurrence of the reportable incident unless NOPSEMA specifies otherwise. Same report to be submitted to NOPTA within seven days after giving the written report to NOPSEMA.	Written	NOPSEMA National Offshore Petroleum Titles Administrator
OPGGS(E) Regulation 50 –	Complete NOPSEMA's Recordable Environmental Incident Monthly Report form.	As soon as practicable after the end of the calendar month, and in any case, not later than 15 days	Written	NOPSEMA

Initiation	Required Information	Timing	Type	Recipient
Recordable Incidents NOPSEMA must be notified of a breach of an EPO or EPS, in the environment plan that applies to the activity that is not a reportable incident.		after the end of the calendar month.		
OPGGS(E) Regulation 51 – Environmental Performance NOPSEMA must be notified of the environmental performance at the intervals provided for in the EP.	Report must contain sufficient information to determine whether or not environmental performance outcomes and standards in the EP have been met.	A detailed environmental performance report for a twelve month period commencing the date of EP acceptance, shall be submitted to NOPSEMA within 3 months post reporting timeframe, on annual basis.	Written	NOPSEMA
Santos' commitment to include activity in Quarterly Consultation Update until activity ends.	The Quarterly Consultation Update will include the activity. This consultation will cease once the activity has ended.	Quarterly.	Written	The Quarterly Consultation Update is circulated to a broad group of Santos' stakeholders, including many of the stakeholders identified in Section 6.2.
WAFIC Requested during consultation	Phone call within 24 hours of incident being identified with potential to impact to the WA commercial fisheries	Within 24 hours	Within 24 hours.	WAFIC: oilandgas@wafic.org.au
WA Museum This is a standing arrangement with DCCEEW	Notify regulators of the discovery of any suspected UCH identified during the planning, development, operation, or decommissioning.	Within 21 days of the discovery.	Written	DCCEEW Australasian Underwater Cultural Heritage Database at: https://environment.gov.au/shipwreck/public/forms/notification

Initiation	Required Information	Timing	Type	Recipient
End of Activity				
OPGGS(E) Regulation 54 – Notifications NOPSEMA must be notified that the activity is completed.	NOPSEMA must be notified that the activity is complete.	Within ten days after cessation of each activity campaign.	Written	NOPSEMA
AHO AFMAAMSA JRCC DAFF DCCEEW Department of Defence DPIRD DEMIRS Recfishwest WAFIC Tuna Australia	Activity cessation notification.	Within ten days after cessation of each campaign.	Written	AHO: datacentre@hydro.gov.au AHS: webmaster@hydro.gov.au AFMA: petroleum@afma.gov.au AMSA's JRCC: rccaus@amsa.gov.au DAFF: Petroleum&Fisheries@agriculture.gov.au DCCEEW: Petroleum&Fisheries@agriculture.gov.au DoD: offshore.petroleum@defence.gov.au DPIRD: Environment@dpird.wa.gov.au DEMIRS: petroleum.environment@dmirs.wa.gov.au Recfishwest: info@recfishwest.org.au WAFIC: oilandgas@wafic.org.au Tuna Australia
OPGGS(E) Regulation 22(7) & 51 – Environmental Performance NOPSEMA must be notified of the environmental performance of the activity.	Report must contain sufficient information to determine whether or not environmental performance outcomes and standards in the EP have been met.	A detailed environmental performance report for a twelve-month period commencing from the date of EP acceptance, shall be submitted to NOPSEMA within 3 months post reporting timeframe, on annual basis.	Written	NOPSEMA
OPGGS(E) Section46 EP ends when titleholder notifies completion, and the Regulator	Notification advising NOPSEMA of end of all activities to which the EP relates and that all obligations have been completed.	Within 12 months of the final Section 54 (2) notification.	Written	NOPSEMA

Initiation	Required Information	Timing	Type	Recipient
accepts the notification. NOPSEMA must be notified that the activity has ended, and all EP obligations have been completed.				

8.10.2 Monitoring and recording emissions and discharges

OPGGS(E)R 2023 Requirements
Regulation 22(6) Implementation Strategy for the Environment Plan
Includes an appropriate implementation strategy and monitoring, recording, and reporting arrangements.
Regulation 34(e) Criteria for Acceptance of Environment Plan
The implementation strategy must provide for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges (whether occurring during normal operations or otherwise), such that the record can be used to assess whether the environmental performance outcomes and standards in the environment plan are being met.

Vessel based discharges to the marine environment associated with this activity will be recorded and controlled in accordance with requirements under the relevant marine orders.

Santos and support vessel contractors will maintain records so that emissions and discharges can be determined or estimated. Such records will be maintained for a period of five years. Contractors are required to make these records available upon request. Santo’s records discharges or emissions (where practicable), to the environment as described in Table 8-5.

Table 8-5: Recorded emissions and discharges

Discharge/emission	Parameter (estimation)	Record	Recording frequency
Atmospheric emissions	Green House Gasses Total Volumes (carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20))	Production Reporting System (PRS), Estimated for NGERS reporting and put into and annual compliance report.	Annually
Chemicals (discharged to marine environment as per Sections 6.6 and 6.7)	Volume	Chemical Risk Assessment. Volumes used will be estimated based on known inventories	For every chemical use with a fate to the marine environment
Oily water	Volume and location (support vessels)	Oil Record Book or equivalent report	For every discharge
Garbage (including food scraps)	Volume and location (support vessel)	Garbage Record Book	For every discharge
Sewage	Volume and location (support vessel)	Sewage Record Book	For every discharge
Unplanned release of solids (dropped objects)	Volume /quantity of object	Incident report	For every release of solid
Unplanned discharge of liquid hazardous materials	Volume	Incident report	For every discharge
Unplanned hydrocarbon release	Volume	Incident report	For every discharge

8.11 Document management

8.11.1 Information management and document control

This EP and the associated OPEP, as well as any approved MoC documents (Section 8.11.2), are controlled documents; and current versions will be available on the Santos intranet. Contractor vessels are also required to maintain current versions of Santos' HSE documents on their vessels.

Environmental performance outcomes and standards will be measured based on the measurement criteria listed in Table 8-2. Such records will be maintained for a period of five years. Contractors are required to make these records available upon request.

8.11.2 Management of change

The MoC process provides a systematic approach to initiate, assess, document, approve, communicate and implement changes to EPs and OPEPs.

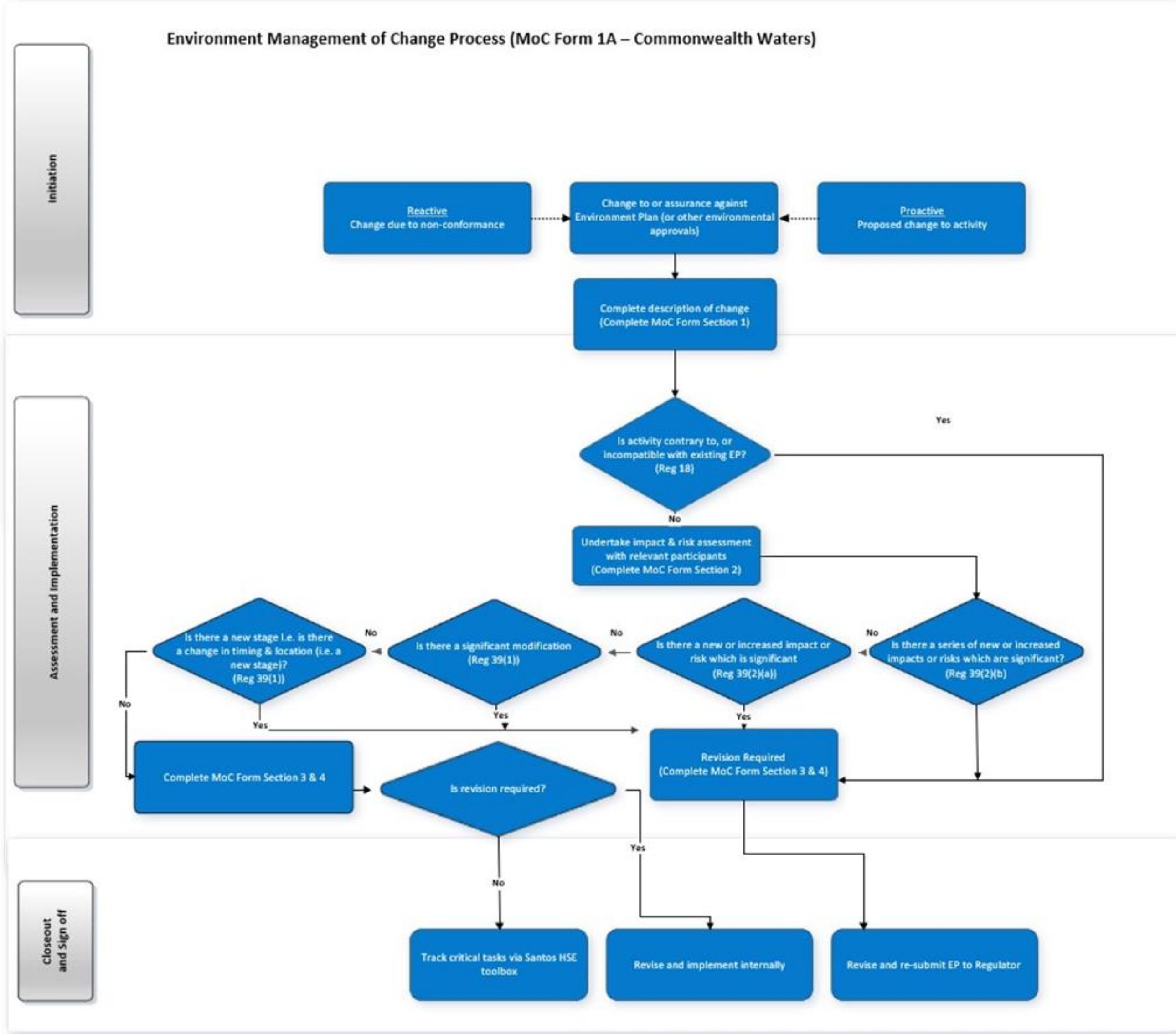
The MoC process considers Regulations 18, 19, 26(3) to (5), 38 and 39 of the OPGGS(E)R and determines if a proposed change can proceed and the manner in which it can proceed. The MoC procedure will determine whether a revision of the EP is required and whether that revision is to be submitted to NOPSEMA. For a change to proceed, the associated environmental impacts and risks must be demonstrated to be acceptable and ALARP. Additional stakeholder consultation may be required, depending on the nature and scale of the change. Additional information about the MoC process is provided in Figure 8-1.

The MoC procedure also allows for the assessment of new information that may become available after EP acceptance, such as new management plans for Australian Marine Parks, new recovery plans or conservation advice for threatened or migratory species, and changes to the Protected Matters Search results. If a review identifies new information, this is treated as a "Change that has an impact on EP", and the MoC process is followed accordingly.

The MoC procedure also includes an assurance check process which applies the MoC process to long- term (usually five-year multi-activity EPs) EPs that may have lengthy periods of time between use or acceptance and activity commencement. Where there is an identified change from the accepted EP content, a check is done to test the 'significance' of the change, to determine whether it can be accommodated which may then result in an MoC as described above.

Accepted MoCs become part of the in-force EP or OPEP, are tracked on a register and are made available on Santos' intranet. Where appropriate, the EP compliance register will be updated so that control measure or EPS changes are communicated to the workforce and implemented. Any MoC will be distributed to the management people identified in

Table 8-3 (as appropriate), and the most relevant management position will ensure the MoC is communicated and implemented, which may include crew meetings, briefings or communications as appropriate for the change.



Notes: The regulation requirements in this chart are summarised. For exact wording, refer to the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.
Regulation 39(3) in relation to a change in titleholder and a new activity resulting in a change of the levy category as per Regulation 38 a revised or new EP is required to be submitted to the Regulator.

Figure 8-1: EP MOC Process

8.11.3 Reviews

This EP includes an assessment of impacts and risks across the operational area during any time of the year for planned and unplanned events given the nature of the 24/7 operations.

It is recognised that the following may change over the term of the EP:

- Legislation
- Businesses conditions, activities, systems, processes and people
- Industry practices
- Science and technology
- Societal and stakeholder expectations.

To ensure Santos maintains up to date knowledge of the industry, legislation and conservation advice, the following tasks are undertaken:

- Maintaining membership of AEP, which provides a mechanism for communicating potential changes in legislation, industry practice and other issues that may affect EP implementation to relevant personnel in Santos
- Undertaking annual spill response exercises to check spill response arrangements and capability are adequate
- Identifying stakeholders prior to any activity commencing under this EP via the mechanisms outlined in Section 4
- Reviewing Appendix B against relevant legislation to capture and review any relevant updates and incorporate as required, and reviewing any recently known published relevant scientific papers
- Subscribing to NOPSEMA's "The Regulator", issued quarterly
- Subscribing to various regulator updates
- Having regular liaison meetings with regulators.

Through maintenance of up to date knowledge (Section 8.11), these changes are identified. If the changes have an impact on the activity or risks described and assessed in this EP, the EP will be reviewed, and any changes required documented in accordance with Santos' MoC procedure (Section 8.11.2).

8.12 Audits and inspections

OPGGS(E)R 2023 Requirements
Regulation 22(5)
The implementation strategy must provide for sufficient monitoring, recording, audit, management of non-conformance and review of the titleholder's environmental performance and the implementation strategy to ensure that the environmental performance outcomes and environmental performance standards in the environment plan are being met.

8.12.1 Audits

Santos audit plans and schedules are reviewed and updated at the beginning of each calendar year and cover all Santos facilities and activities. Santos' audit schedule may be amended to accommodate operational priorities, activity risk, personnel availability or high audit demand during certain periods (e.g. regulatory audits, contractor audits).

Audits will be undertaken in a manner consistent with Santos' Assurance Procedure (SMS-LRG-0S03-PD-01).

Audit scope typically includes a selection of control measures and environmental performance standards and outcomes. However, audits may also include other parts of the EP.

Audits findings may include opportunities for improvement and non-conformances. Audit non-conformances are managed as described in Section 8.12.3.

8.12.2 Inspections

During an activity, HSE inspections will be conducted to identify hazards, incidents and EP non-conformances to check compliance against all of the environmental performance outcomes and standards of this EP (Table 8-2). Any in-field opportunities for improvement or corrective actions will be discussed during the inspection with the work area supervisor and/or crew. Inspection reports will be distributed for review to Santos relevant personnel (e.g. Operations Superintendent, Santos on-board representatives), and HSE Department representatives.

8.12.3 Non-conformance management

EP non-conformances will be addressed and resolved by a systematic corrective action process as outlined in Assurance Procedure (SMS-LRG-0S03-PD-01).

Non-conformances arising from audits and inspections will be entered into Santos' incident and action tracking management system (i.e. HSE Toolbox). Once entered, corrective actions, time frames and responsible persons (including action owners and event validators) will be assigned. Corrective action 'close out' will be monitored using a management escalation process.

8.12.4 Continuous improvement

For this EP, continuous improvement will be driven the list below and may result in a review of the EP with changes applied in accordance with Section 8.11.2:

- Improvements identified from the review of business-level HSE key performance indicators
- Actions arising from Santos and departmental HSE improvement plans
- Corrective actions and feedback from HSE audits and inspections, incident investigations and after -action reviews
- Opportunities for improvement and changes identified during pre-activity reviews and MoC documents
- Actions taken to address concerns and issues raised during the ongoing stakeholder consultation process (Section 4)
- Identified continuous improvement opportunities assessed in accordance with the MoC process (Section 8.11.2) to ensure any potential changes to this EP or OPEP are managed in accordance with the OPGGS(E) Regulations 2023 and in a controlled manner.

8.13 Post-acceptance consultation implementation strategy

8.13.1 Post-acceptance consultation implementation strategy – First nations people and groups, local governments, communities and industry

Santos is committed to appropriate post acceptance consultation implementation for this Activity with relevant government authorities and other relevant interested persons and organisations.

Post acceptance consultation activities for this EP will be principally supported by Santos' regional engagement program for its existing operational footprint in the Carnarvon Basin, with a focus on First Nations people and groups and local governments, communities, and industry with interests in the lands and waters of the adjacent Pilbara region.

8.13.2 First Nations people and groups

Santos will undertake consultation over the life of the activity with First Nations representative organisations, such as Prescribed Body Corporates (PBCs) and Native Title Representative Bodies.

These engagements will be undertaken principally through Santos' existing regional engagement program, which has a focus on engaging those organisations with closest proximity to Santos' existing, proposed and planned activities in the Carnarvon Basin.

Having regard to Santos' experience consulting with First Nations groups, and feedback from First Nations relevant persons, Santos considers that consultation through representative bodies provides an appropriate mechanism for ongoing consultation with First Nations relevant interested persons.

Representative bodies provide for regular, culturally appropriate engagement, including processes for dissemination of information to First Nations Elders, cultural leaders and communities in a manner that is readily accessible and culturally appropriate.

Santos is currently in discussion with four Pilbara PBCs on the establishment of consultation frameworks that will provide for effective and regular engagement on proposed, planned, existing and completed activities. These PBCs are listed below, which have coastal interests from North-West Cape to Dampier.

- Nganhurra Thanardi Garrbu Aboriginal Corporation
- Buurabalayji Thalanyji Aboriginal Corporation
- Wirrawandi Aboriginal Corporation
- Ngarluma Aboriginal Corporation

Santos has also identified Murujuga Aboriginal Corporation as key organisation for engagement as part of the regional engagement program.

Santos plans to grow this regional engagement network to include PBCs in the eastern Pilbara and western Kimberley to support future activities in the Bedout Basin (north of Port Hedland), given the proximity of proposed activities to these regions.

Engagement of all First Nations organisations will include consideration of culturally appropriate management measures for inclusion within EPs, where First Nations people believe that there may be impacts or risks, or have concerns with regards to:

- Traditional lands and waters
- Sea country interests
- Totemic species

8.13.3 Local government, communities, and industry

Similarly, Santos will use its existing regional engagement program, to support consultation over the life of the activity in regional communities proximate to Santos' existing, proposed and planned activities. Representative groups identified by Santos for engagement include:

- Local government – Shire of Exmouth, Shire of Ashburton and City of Karratha
- Local industry – Exmouth Chamber of Commerce and Industry, Onslow Chamber of Commerce and Industry and Karratha and Districts Chamber of Commerce and Industry
- Community Groups – Exmouth Community Liaison Group, Shire of Ashburton Onslow Community Information Sessions

This regional approach is complementary to Santos existing and ongoing engagement of representative groups for other offshore marine user groups, including commercial fishing organisations.

8.13.4 Post-acceptance consultation implementation strategy – approach

Activity notifications and reports will be made in accordance with Table 8-4. The notifications and reports are based on legislative requirements, standing arrangements with particular Relevant Persons, Relevant Persons' requests for notification made during Regulation 25 consultation, or as otherwise deemed appropriate by Santos.

Santos will also provide quarterly updates on the activity to registered / subscribed interested parties

Santos will apply the regional engagement model described in Section 8.13.3 to consider the preference of relevant government authorities and other relevant interested persons and organisations when determining the frequency and method of additional updates.

Santos will apply continue to accept, assess, and respond to post acceptance consultation feedback during the life of the Activity. Records of any post acceptance consultation will be maintained in an appropriate Santos consultation database.

If, during post acceptance consultation, Santos receives information demonstrating a new or increased environmental impact or risk that is not provided for in this EP, as in force at the time, Santos will apply its Management of Change process outlined in Section 8.11.2.

Santos will maintain a database of relevant authorities, and other relevant interested persons and organisations for this Activity. This includes updating its database in light of post acceptance consultation, including identification of new Relevant Persons.

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Appendix A Environment, Health and Safety policy

Environment, Health & Safety

Santos

Policy

Our Commitment

Santos is committed to being the safest gas company wherever we have a presence and preventing harm to people and the environment

Our Actions

We will:

1. Integrate environment, health and safety management requirements into the way we work
2. Comply with all relevant environmental, health and safety laws and continuously improve our management systems
3. Include environmental, health and safety considerations in business planning, decision making and asset management processes
4. Identify, control and monitor risks that have the potential for harm to people and the environment, so far as is reasonably practicable
5. Report, investigate and learn from our incidents
6. Consult and communicate with, and promote the participation of all workers to maintain a strong environment, health and safety culture
7. Empower our people, regardless of position, to "Stop the Job" when they feel it necessary to prevent harm to themselves, others or the environment
8. Work proactively and collaboratively with our stakeholders and the communities in which we operate
9. Set, measure, review and monitor objectives and targets to demonstrate proactive processes are in place to reduce the risk of harm to people and the environment
10. Report publicly on our environmental, health and safety performance

Governance

The Environment Health Safety and Sustainability Committee is responsible for reviewing the effectiveness of this policy.

This policy will be reviewed at appropriate intervals and revised when necessary to keep it current.

Kevin Gallagher

Managing Director & CEO

Status: APPROVED

Document Owner:	David Banks, Chief Operating Officer		
Approved by:	The Board	Version:	3

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Appendix B Legislation

Commonwealth and State legislation

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
Commonwealth					
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	This Act provides for the preservation and protection from injury or desecration areas and objects that are of significance to Aboriginal people, under which the Minister may make a declaration to protect such areas and objects. The Act also requires the discovery of Aboriginal remains to be reported to the Minister.	Yes	Commonwealth – Department of Environment and Energy	No planned activity being undertaken on land or near shore. No known sites of Aboriginal Heritage Significance within the operational area or EMBA. May be relevant in the event of a hydrocarbon spill requiring shoreline access (e.g. shoreline clean-up).	Section 6.7 – Spill response operations
Australian Ballast Water Requirements, Version 8 (2020)	Australian Ballast Water Management Requirements outline the mandatory ballast water management requirements to reduce the risk of introducing harmful aquatic organisms into Australia's marine environment through ballast water from international vessels. These requirements are enforceable under the Biosecurity Act 2015.	Yes	Commonwealth – Department of Agriculture and Water Resources	Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange.	Section 7.1 – Introduction of invasive marine species
Australian Heritage Council Act 2003	This Act identifies areas of heritage value listed on the Register of the National Estate and sets up the Australian Heritage Council and its functions.	Yes	Australian Heritage Council	There are no national heritage places found on the National Heritage List, within the operational area. The Dampier Archipelago and The Ningaloo Coast national heritage places are within the regional area.	Section 3.2.5 – Protected and Significant areas
Australian Maritime Safety Authority Act 1990 (AMSA Act)	This Act specifies that AMSA's role includes protection of the marine environment from pollution from ships and other environmental damage caused by shipping. AMSA is responsible for administering the Marine Orders in Commonwealth waters. AMSA is the spill control agency for shipping sourced spill in Commonwealth waters. Facilitates international cooperation and mutual assistance in preparing and responding to a major oil spill incident and encourages countries to develop and maintain an adequate capability to deal with oil pollution emergencies. Requirements are given effect through AMSA. AMSA is the lead agency for responding to oil spills in the marine environment and is responsible for the Australian National Plan for Maritime Environmental Emergencies.	Yes	Commonwealth – Department of Infrastructure, Regional Development and Cities	Vessel movements. Marine Orders administration. Spill control agency (in Commonwealth waters).	Section 7.8 – Surface release of diesel
Marine Orders	Marine Orders (MO) are subordinate rules made pursuant to the Navigation Act 2012 and Protection of the Sea (Prevention of Pollution	Yes	AMSA	Vessel movements, safety, discharges and emissions.	Sections 6 and 7 –

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	from Ships) Act 1983 affecting the maritime industry. They are a means of implementing Australia's international maritime obligations by giving effect to international conventions in Australian law.				Planned and unplanned events
Maritime Powers Act 2013	Protects the heritage values of shipwrecks and relics for shipwrecks over 75 years. It is an offence to interfere with a shipwreck covered by this Act. Available historic shipwreck locations covered by international conventions enacted by this legislation have been identified and assessed (as applicable) within this EP.	Yes	The Department of Immigration and Border Protection	No planned interaction or interference. Potential impact could be due to a hydrocarbon spill.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills
Biosecurity Act 2015 Biosecurity Regulations 2016	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.	Yes	Commonwealth – Department of Agriculture and Water Resources	Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange.	Section 7.1 – Introduction of invasive marine species
Corporations Act 2001	This Act is the principal legislation regulating matters of Australian companies, such as the formation and operation of companies, duties of officers, takeovers and fundraising.	Yes	Commonwealth – Australian Securities and Investments Commission (ASIC)	The titleholder has provided ACN details within the meaning of the Act.	Section 1.6 Titleholder
Climate Change Authority Act 2011	This Act establishes the Climate Change Authority (CCA). The Authority is to conduct reviews under the *Carbon Credits (Carbon Farming Initiative) Act 2011* and the *National Greenhouse and Energy Reporting Act 2007*	Yes	Climate Change Authority (CCA)	This Authority applies to the atmospheric emissions through combustion engine use to operate the vessels associated with the activity.	Section 6.3– Atmospheric emissions
Environment Protection and Biodiversity Conservation Act 1999 Environment Protection and	This Act is the Australian Government's key piece of environmental legislation. The Act aims to: • protect matters of national environmental significance (MNES) • provide for Commonwealth environmental assessment and approval processes	Yes	Commonwealth – Department of Environment and Energy	The activity involves: • Interaction with marine fauna (MNES which are threatened and migratory species • Light emissions • Underwater noise	Section 6.1.7 – Noise emissions Section 6.2 – Light emissions

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
Biodiversity Conservation Amendment Regulations 2006	• provide an integrated system for biodiversity conservation and management of protected areas. Australian Marine Park Management Plans were also developed under this Act. EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans			• Operational discharges • Chemical and residual hydrocarbon discharges • Vessel movements • Unplanned hydrocarbon/chemical release and response activities including activities within AMPs.	Section 6.4 – Seabed and benthic habitat disturbance Section 6.6 – Operational discharges Section 6.7 – Chemical and residual hydrocarbon discharges Section 7.2 – Marine fauna interaction Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned releases
Environment Protection and Biodiversity Conservation Act 1999 – Proclamation – Ningaloo Marine Park (Commonwealth Waters)	The Declaration of Ningaloo Marine Park in Commonwealth Waters.	Yes	Commonwealth – Department of Environment and Energy	Unplanned hydrocarbon/chemical release	Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned releases
Underwater Cultural Heritage Act 2018	This Act extends protection provided under the *Historic Shipwrecks Act 1976* to other wrecks such as submerged aircraft and human remains. It also increases penalties applicable to damaged sites.	Yes		No planned interaction or interference to shipwrecks. Potential impact could be due to a hydrocarbon spill, but the credible spill is to surface; therefore, shipwrecks are highly unlikely to be impacted. 15 shipwrecks identified within EMBA.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
National Greenhouse and Energy Reporting Act 2007	Introduces a single national reporting framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects and energy use and production of corporations.	Yes	Commonwealth – Department of Environment and Energy Climate Change Authority	Atmospheric emissions through combustion engine use to operate the vessels. To reduce impact of GHG emissions, Santos will comply with MARPOL Annex VI (Marine Orders Part 97: Marine Pollution Prevention – Air Pollution) and require the use of low sulphur fuel.	Section 6.3 – Atmospheric emissions
Maritime Legislation Amendment (Prevention of Air Pollution from Ships) Act 2007	This Act implements the requirements of MARPOL 73/78 Annex VI for shipping in Commonwealth waters.	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Atmospheric emissions through combustion engine use to operate the vessels. To reduce impact of GHG emissions, Santos will comply with MARPOL Annex VI (Marine Orders Part 97: Marine Pollution Prevention – Air Pollution) and require the use of low sulphur fuel.	Section 6.3 – Atmospheric emissions
Maritime Powers Act 2013 (Administered by Department of Home Affairs)	Protects the heritage values of shipwrecks and relics for shipwrecks over 75 years. It is an offence to interfere with a shipwreck covered by this Act. Available historic shipwreck locations covered by international conventions enacted by this legislation have been identified and assessed (as applicable) within this EP.	Yes	The Department of Immigration and Border Protection (DIBP)	A number of listed historic shipwrecks overlap the EMBA in both Commonwealth and State waters. There is a potential impact to underwater cultural heritage in the event of a hydrocarbon spill and response.	Section 6.9 – Spill response activities Section 7.6– Release of hydrocarbons
National Greenhouse and Energy Reporting Act 2007	Introduces a single national reporting framework for the reporting and dissemination of information about greenhouse gas emissions, greenhouse gas projects and energy use and production of corporations.	Yes	DCCEEW and the CCA	This Act applies to the atmospheric emissions through combustion engine use to operate the vessels associated with the activity.	Section 6.3 – Atmospheric emissions
Navigation Act 2012	An Act regulating navigation and shipping including Safety of Life at Sea (SOLAS). A number of Marine Orders enacted under this Act apply directly to offshore petroleum exploration and production activities: • Marine Orders – Part 17: Liquefied gas carriers and chemical tankers • Marine Orders – Part 21: Safety of navigation and emergency procedures	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Vessel movements, marine safety and shipping movements.	Section 6.5 – Interaction with other marine users

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	• Marine Orders – Part 30: Prevention of collisions • Marine Orders – Part 47: Mobile Offshore Drilling Units • Marine Orders – Part 50: Special purpose ships • Marine Orders – Part 57: Helicopter Operations • Marine Order – Part 59: Off-shore industry vessel operations • Marine Orders – Part 60: Floating Offshore facilities.				
Offshore Petroleum and Greenhouse Gas Storage Act 2006 Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023	Petroleum exploration and development activities in Australia's offshore areas are subject to the environmental requirements specified in the OPGGS Act and associated Regulations. The OPGGS Act contains a broad requirement for titleholders to operate in accordance with "good oil-field practice". The OPGGS Environment Regulations provide an objective based regime for the management of environmental performance for Australian offshore petroleum exploration and production activities in areas of Commonwealth jurisdiction.	Yes	NOPSEMA	Undertaking activity is a petroleum activity regulated by NOPSEMA. The EP is developed to meet the environment regulations.	Whole of EP
Ozone Protection and Synthetic Greenhouse Gas Management Act 1989 *Ozone Protection and Synthetic Greenhouse Gas Management Reform) closing the hole in the Ozone Layer) Act 2022*	Regulates the manufacture, importation and use of ozone depleting substances (typically used in fire-fighting equipment and refrigerants). Applicable to the handling of any ozone-depleting substance.	Yes	Commonwealth – Department of Climate Change, Energy, the Environment and Water	No import, export or manufacture activities of ozone-depleting substances. Ozone-depleting substances are being phased out and are rarely found on a vessel's or mobile offshore drilling unit's refrigeration system.	Section 6.3 – Atmospheric emissions
Protection of the Sea (Powers of Intervention) Act 1981 Protection of the Sea (Powers of Intervention) Regulations 1983	The Act authorises AMSA (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.	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Vessel discharges. Vessel movements. Only relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78:	Section 6.5 – Interaction with other marine users Section 6.6 – Operational discharges Section 6.7 – Chemical and residual

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
				• Marine Orders – Part 91: Marine Pollution Prevention – Oil • Marine Orders – Part 93: Marine Pollution Prevention – Noxious Liquid Substances • Marine Orders – Part 95: Marine Pollution Prevention – Garbage • Marine Orders – Part 96: Marine Pollution Prevention – Sewage • Marine Orders – Part 98: Marine Pollution – Harmful anti-fouling Systems.	hydrocarbon discharges Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned releases Section 7.1 – Introduction of invasive marine species
Protection of the Sea (Prevention of Pollution from Ships) Act 1983 Protection of the Sea (Prevention of Pollution from Ships) (Orders) Regulations 1994	This Act relates to the protection of the sea from pollution by oil and other harmful substances discharged from ships. This Act disallows any harmful discharge of sewage, oil and noxious substances into the sea and sets the requirements for a shipboard waste management plan. The following Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78: • Marine Orders – Part 91: Marine Pollution Prevention – Oil • Marine Orders – Part 93: Marine Pollution Prevention – Noxious Liquid Substances • Marine Orders – Part 94: Marine Pollution Prevention – Harmful Substances in Packaged Forms • Marine Orders – Part 95: Marine Pollution Prevention – Garbage • Marine Orders – Part 96: Marine Pollution Prevention – Sewage • Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution • Marine Orders – Part 98: Marine Pollution –Harmful anti-fouling Systems.	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Vessel discharges. Vessel movements. Only relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78: • Marine Orders – Part 91: Marine Pollution Prevention – Oil • Marine Orders – Part 93: Marine Pollution Prevention – Noxious Liquid Substances • Marine Orders – Part 95: Marine Pollution Prevention – Garbage • Marine Orders – Part 96: Marine Pollution Prevention – Sewage	Section 6.5 – Interaction with other marine users Section 6.6 – Operational discharges Section 6.7 – Chemical and residual hydrocarbon discharges Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned releases Section 7.1 – Introduction of invasive marine species

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
				• Marine Orders – Part 98: Marine Pollution – Harmful anti-fouling Systems.	
Protection of the Sea (Civil Liability of Bunker Oil Pollution Damage) Act 2008	This Act implements the requirements for the International Convention on Civil Liability for Bunker Oil Pollution Damage.	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Refuelling may be undertaken at sea.	Section 7.4 – Hazardous liquid releases
Protection of the Sea (Harmful Antifouling Systems) Act 2006	This Act relates to the protection of the sea from the effects of harmful anti-fouling systems. It prohibits the use of harmful organotins in ant-fouling paints used on ships.	Yes	Commonwealth, Department of Infrastructure, Regional Development and Cities	Vessel movements in Australian Waters. Vessels are required to have biofouling systems in place to prevent introduction of invasive marine species/ harmful impact on Australian biodiversity.	Section 7.1 – Introduction of invasive marine species
State					
Fish Resources Management Act 1994 Fish Resources Management Regulations 1995.	This Act establishes a framework for management of fishery resources and is the nominated lead agency responsible for implementing Western Australian marine biosecurity management requirements through implementation of the *Fish Resources Management Act 1994* (FRMA 1994) and associated regulations.	Yes	Department of Primary Industries and Regional Development (DPIRD)	Introduction of invasive marine species.	Section 7.1 – Introduction of invasive marine species
Underwater Cultural Heritage Act 2018 Draft Underwater Cultural Heritage guidelines 2023	This Act protects its shipwrecks, sunken aircraft and other types of underwater heritage and their associated artefacts. These guidelines outline the requirements of the UWH Act so proponents can plan for and implement the necessary risk assessment and management strategies to protect UCH from any direct or indirect impacts and to manage any residual impacts to acceptable levels. Any adverse impact to protected UCH is unacceptable, unless these impacts are mitigated and managed in accordance with the UCH Act, the UNESCO 2001 Convention and the Annex Rules. Activities of any kind that have the potential to impact protected UCH must comply with the requirements	Yes	DCCEEW	A number of listed historic shipwrecks overlap the EMBA in both Commonwealth and State waters. There is a potential impact to underwater cultural heritage in the event of a hydrocarbon spill and response Anyone who finds the remains of a vessel or aircraft, or an article associated with a vessel or aircraft, must notify the relevant authorities, as soon as possible but ideally no later than after one week, and to give them information about what has been found and its location.	Section 3.2.7 – Socio-economic receptors Section 6.9– Spill response activities Section 7.5 – Overview of unplanned release of hydrocarbons Section 7.6 – Release of hydrocarbons

Legislation	Summary	Relevant to activity?	Administering Authority	Relevant aspects of the activity	EP Section
	of the UCH Act and, if applicable, any relevant state or the Northern Territory legislation. To satisfy their obligations under the UCH Act, proponents must be able to demonstrate: • that they are aware of the relevant UCH legislation • that their actions will be compliant with the legislation; and that they will implement appropriate and effective risk mitigation strategies to prevent or reduce the likelihood or severity of accidental impacts to protected UCH.				
Environmental Protection (Sea Dumping) Act 1981	This Act requires sea dumping permits to be required for particular activities and gives effect to the United Nations Convention on the Law of the Sea and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) and associated Protocol.	Yes	DCCEEW	Planned operational discharges occur as parted of operations.	Section 6.6– Planned Operational Discharges

International Agreements and Conventions

International Agreements and Conventions	Summary	Relevant to Activity?	Relevant Aspects	EP Section
1996 Protocol To The Convention On The Prevention Of Marine Pollution By Dumping Of Wastes And Other Matter, 1972	Implemented in WA Marine (Sea Dumping) Act and Environmental Protection (Sea Dumping) Act 1981.	Yes	Sewage and wash-down water generated from the Reindeer WHP during visits Sewage, grey water, and putrescible wastes generated from support vessels Deck drainage/deck wash-down, cooling, brine, ballast and bilge water from support vessels Hydraulic fluid released by valve operation on subsea infrastructure Various discharges from planned maintenance activities.	Section 6.6 – Planned Operational discharges
Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and Their Environment 1974 (commonly referred to as the Japan Australia Migratory Bird Agreement or JAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and Japan. Implemented in EPBC Act 1999.	Yes	Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills
Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and Their Environment 1986 (commonly referred to as the China Australia Migratory Bird Agreement or CAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and China. Implemented in EPBC Act 1999.	Yes	Only relevant in so far as the credible spill scenario may result in impact to migratory seabirds foraging in area.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills
Convention for the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989 (Basel Convention)	This convention deals with the transboundary movement of hazardous wastes, particularly by sea. Implemented in Hazardous Waste (Regulation of Exports and Imports) Act 1989.	No	Activity does not involve transboundary movement of hazardous wastes.	N/A
United Nations Convention on Biological Diversity – 1992	An international treaty to sustain life on earth.	Yes	Relevant only insofar as the activity may interact with MNES (threatened and migratory species) protected under the EPBC Act.	Section 6.1.7 – Noise emissions Section 6.2 – Light emissions Section 6.4 – Seabed and benthic habitat disturbance Section 7.2 – Interaction with marine fauna

International Agreements and Conventions	Summary	Relevant to Activity?	Relevant Aspects	EP Section
				Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned releases
Convention on Oil Pollution Preparedness, Response and Co-operation 1990 (OPRC 90)	This convention comprises national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, seaports and oil handling. The convention recognises that in the event of pollution incident, prompt and effective action is essential.	Yes	In the event that worse-case credible spill scenarios may enact a national arrangement for response.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills Section 6.7 – Hydrocarbon spill response
Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)	The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species.	Yes	Only relevant in so far as the credible spill scenario may result in impact to MNES protected migratory species.	Sections 7.5, 7.5.6.5, 7.7, 7.8 – Unplanned hydrocarbon spills Section 6.7 – Hydrocarbon spill response
International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage (Fund 92)	This convention ensures compensation is provided for damage caused by oil pollution.	No	Relevant to oil tankers, not supply or support vessels.	N/A
International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78)	This Convention and Protocol (together known as MARPOL 73/78) build on earlier conventions in the same area. MARPOL is concerned with operational discharges of pollutants from ships. It contains five Annexes, dealing respectively with oil, noxious liquid substances, harmful packaged substances, sewage and garbage. Detailed rules are laid out as to the extent to which (if at all) such substances can be released in different sea areas. The legislation giving effect to MARPOL in Australia is the Protection of the Sea (Prevention of Pollution from Ships) Act 1983, the Navigation Act 1912 and several Parts of Marine Orders made under this legislation.	Yes	Already dealt with through the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 – refer to legislation table above.	N/A
International Convention for the Safety of Life at Sea 1974	This convention is generally regarded as the most important of all international treaties concerning the safety of merchant ships Implemented in the Air Navigation Act 1920.	Yes	Only relevant in so far as SOLAS relates to safety aspects of the activity, such as navigation aids which reduce potential for vessel collision and hydrocarbon release to the environment.	Section 6.5 – Interaction with other marine users

International Agreements and Conventions	Summary	Relevant to Activity?	Relevant Aspects	EP Section
International Convention on Civil Liability for oil pollution damage (1969)	This convention provides a mechanism for ensuring the payment of compensation for oil pollution damage.	No	Relevant to oil tankers.	N/A
International Convention for the Control and Management of Ships' Ballast Water and Sediments (Ballast Water Convention) 2004	The IMO has been addressing the problem of invasive marine species in ship's ballast water since the 1980s. Ballast water and sediments guidelines were adopted in 1991 and the ballast water convention was adopted in 2004. Recent accession by Finland has triggered the final entry into force of these international requirements. As a result, the International Convention for the Control and Management of Ships Ballast Water and Sediment will enter into force on 8th September 2017 (IMO Briefing 22 2016). It aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Ballast Water Management systems must be approved by the Administration in accordance with this IMO Guidelines.	Yes	Potential internationally sourced vessel operating in Australian Waters which could have the potential for introduction of Invasive Marine Species and potential ballast water exchange.	Section 7.1 – Introduction of invasive marine species
United Nations Convention on the Law of the Sea (UNCLOS) (1982)	Part XII of the convention sets up a general legal framework for marine environment protection. The convention imposes obligations on State Parties to prevent, reduce and control marine pollution from the various major pollution sources, including pollution from land, from the atmosphere, from vessels and from dumping (Articles 207 to 212). Subsequent articles provide a regime for the enforcement of national marine pollution laws in the many different situations that can arise. Australia signed the agreement relating to the implementation of Part XI of the Convention in 1982, and UNCLOS in 1994.	Yes	Only relevant to the extent that Santos will comply with MARPOL through the following relevant Marine Orders relating to marine pollution prevention have been put in place to give effect to relevant regulations of Annexes I, II, III, IV, V and VI of MARPOL 73/78: • Marine Orders – Part 91: Marine Pollution Prevention – Oil • Marine Orders – Part 93: Marine Pollution Prevention – Noxious Liquid Substances • Marine Orders – Part 95: Marine Pollution Prevention – Garbage • Marine Orders – Part 96: Marine Pollution Prevention – Sewage • Marine Orders – Part 97: Marine Pollution Prevention – Air Pollution	Section 6.6 – Operational discharges Sections 7.3, 7.4, 7.5, 7.5.6.5, 7.7, 7.8 – for unplanned releases Section 7.1 – Introduction of invasive marine species

International Agreements and Conventions	Summary	Relevant to Activity?	Relevant Aspects	EP Section
			• Marine Orders – Part 98: Marine Pollution – Harmful anti-fouling Systems.	
United Nations Framework Convention on Climate Change (1992)	The objective of the convention is to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system. Australia ratified the convention in December 1992, and it came into force on 21 December 1993.	Yes	Only relevant to the extent that to reduce impact of GHG emissions associated with vessel use, Santos will comply with MARPOL Annex VI (Marine Orders Part 97: Marine Pollution Prevention – Air Pollution) And require the use of low sulphur fuel.	Section 6.3 – Atmospheric emissions

Decommissioning Legislation

Whilst decommissioning is not an activity within the scope of this EP, Section 2.13 explains the planning for decommissioning. The table below summarises the legislation that may be relevant to decommissioning

Legislation Relevant to Decommissioning the WHP and DC gas supply pipeline

Document Name	Overview
OPGGS Act 2006	The OPGGS Act is the primary legislation governing offshore decommissioning. Section 572 of the Act is a long-standing, key provision and requires titleholders to remove structures, equipment or other property when no longer being used in connection with operations or to be used.
The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Australian Government's principal piece of environment legislation. The EPBC Act protects Australia's native species and ecological communities by providing for: • identification and listing of species and ecological communities as threatened. • development of conservation advice and recovery plans for listed species and ecological communities. • development of a register of critical habitat. • recognition of key threatening processes. • where appropriate, reducing the impacts of these processes through threat abatement plans and non-statutory threat abatement advice. All OPGGS activities must be carried out in a manner consistent with the principles of ecologically sustainable development which is an objective of the EPBC Act.
Treaty Between Australia and the Democratic Republic Timor-Leste Establishing Their Maritime Boundaries in the Timor Sea (the Treaty) in March 2018	Australia and Timor-Leste signed the treaty to establish maritime boundaries between the two signatory countries. It encompasses the delimitation between Timor-Leste and Australia of both the continental shelf (which entails rights to exploit seabed resources, such as petroleum) and the exclusive economic zone in the Timor Sea. Under the Treaty (Article 3 of Treaty Annex D) Australia exercises exclusive jurisdiction over the Pipeline, and in exercising this exclusive jurisdiction shall cooperate with the relevant Timor-Leste statutory authority in relation to the Pipeline. Under the Memorandum of Understanding between the Autoridade Nacional do Petróleo e Minerais of Timor-Leste (ANPM), the Australian Commonwealth Department of Industry, Innovation and Science (DIIS), and NOPSEMA on cooperation between regulatory authorities in relation to the Bayu-Undan Gas Field and Pipeline signed on 28 August 2019 (the MOU), it was agreed that:

Document Name	Overview
	• NOPSEMA will exclusively regulate the Pipeline (from the point immediately adjacent to the downstream side of the SSIV) on behalf of Australia. • NOPSEMA will regulate the decommissioning of the Pipeline consistent with the terms of the relevant environment plan or plans. Regulation will be in accordance with the OPGGS Act and associated Regulations. • In accordance with the OPGGS Act and associated Regulations NOPSEMA will ensure that ANP is consulted as relevant persons by the titleholder for the Pipeline as part of the preparation of environment plans for any activities, including decommissioning activities. • In exercising exclusive jurisdiction over the Pipeline and to ensure the safe and efficient decommissioning of the Pipeline, NOPSEMA will keep the ANP informed (copying DIIS) on decommissioning decisions related to the Pipeline in a prompt and timely manner. Consequently, NOPSEMA is the regulator of the environmental management of the Pipeline in Timor-Leste and Cth waters under and in accordance with the OPGGS Act and associated Regulations.
Environment Protection (Sea Dumping) Act 1981	The *Environment Protection (Sea Dumping) Act 1981* regulates the dumping or abandonment of platforms or other man-made structures in Australian waters and from Australian vessels in any part of the sea. As party to the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (the London Protocol), the Australian Government has a responsibility to meet Australia's obligations to protect the marine environment from pollution. The DCCEEW Sea Dumping Act webpage states the following: • Oil and gas activities that may need a sea dumping permit include: • Dumping (in this case the movement from the current location and disposal into Australian waters) of any oil and gas infrastructure associated with a platform or other man-made structure. • Abandonment in-situ of most oil and gas infrastructure within Australian waters, in the location where it originally served its purpose. • Placement of an artificial reef within Australian waters that includes decommissioned oil and gas infrastructure. • Activities exempt from sea dumping permit requirements: • Abandoning in-situ an export pipeline or cable (not wholly contained within a field) that will not be moved, modified, or augmented in any way. This does not include flowlines, inter or intra field pipelines. Given the above exemption for export pipelines it is considered that the Pipeline left in situ (and not moved or altered) will be exempt from the Sea Dumping Act. However, DCCEEW recommends that proponents contact DCCEEW to clarify obligations early in their planning phases.

Whilst decommissioning is not an activity within the scope of this EP, Section 2.13 explains the planning for decommissioning. The table below summarises the guidance material that may be relevant to decommissioning

Guidance Material Relevant to Decommissioning the WHP and DC gas supply pipeline

Document Name	Doc. Type	Author	Overview
Guideline: Offshore petroleum decommissioning (Effective 2 March 2022, version 4)	Guideline	The Department of Industry, Science, Energy and Resources, (DISER)	The purpose of the guideline is to clarify the application, operation and interaction between components of the Cth regime for decommissioning offshore petroleum property in Cth waters under the OPGGS Act, associated regulations and, where applicable, other Cth laws. The guideline is to assist offshore petroleum titleholders to plan and seek the regulatory approvals necessary to undertake a decommissioning activity, and to understand the expectations of relevant decision makers. The key principles of the decommissioning framework are outlined in section 3 of Guideline and include the following: • Decommissioning is the responsibility of titleholders.

Document Name	Doc. Type	Author	Overview
			• Early planning for decommissioning is encouraged. • Removal of all property is the "base case". • Decommissioning must be completed before the end of title. Exceptions to full removal may apply if titleholders can demonstrate that the alternative approach delivers equal or better environmental outcomes compared to complete removal and meets all applicable requirements under the OPGGS Act and regulations, and other applicable laws.
Section 572 Maintenance and Removal of Property (N-00500-PL1903 A720369)	Policy	NOPSEMA	**3. Duties and requirements under section 572** *Maintenance of property etc. (section 572(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 • b. used in connection with the operations authorised by the permit, lease, licence or authority. *Removal of property etc. (section 572(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 which the titleholder is or will be engaged • b. that are authorised by the permit, lease, licence or authority. *Obligations of maintenance and removal of property etc. are subject to other provisions (section 572(7))* Section 572(7) of the OPGGS Act allows for titleholders to make other arrangements that are satisfactory to NOPSEMA with respect to property etc. for the purposes of section 270 of the OPGGS Act via an accepted permissioning document. Other arrangements in the context of this regulatory policy include where a titleholder intends to do something that is different from the requirements of section 572(2) and (3). Maintenance and removal of property etc. requirements are subject to other provisions of the OPGGS Act, the regulations, directions given by NOPSEMA or the responsible Commonwealth Minister, and any other law. The maintenance and removal requirements do not substitute for, or override other provisions of, or arrangements made under, the OPGGS Act or regulations. If a titleholder intends to make other arrangements in relation to property etc. under section 572(7), the proposed approach should be included in permissioning documents and accepted by NOPSEMA prior to the property etc. being brought into the title area. Any changes in the titleholders' approach should be addressed in subsequent revisions of permissioning documents. **5 Removal of property** Section 572(3) requires titleholders to remove property etc. when it is neither used, nor to be used, in connection with the operations in which the titleholder is engaged and that are authorised by the title. Activities associated with the removal of property etc. are primarily regulated through the submission and acceptance of permissioning documents under the Environment, Safety and RMA Regulations.

Document Name	Doc. Type	Author	Overview
			NOPSEMA applies the following principles when considering compliance with this requirement: • titleholders are expected, from the earliest stages of offshore project development and petroleum activity planning, to consider how property removal requirements will satisfy NOPSEMA for the purposes of section 270(1) of the OPGGS Act • removal of all property etc. is the base case for all offshore operations and should inform the basis for field development planning • all property etc. is to be designed, constructed, installed, maintained, modified and operated to ensure it can be removed • removal should be planned for and undertaken when property etc. is neither used, nor to be used throughout the operations authorised by the title • removal of all property etc. must be completed while the title is still in force • where titleholders engage contractors to operate facilities, titleholders remain ultimately responsible for ensuring that adequate provisions including approval, assurance and oversight are in place to meet the removal of property etc. requirements on titleholders. **5.1.2. Environment plan** In order to accept an EP, NOPSEMA must be reasonably satisfied that the EP meets the criteria for acceptance under Regulation 34 of the OPGGS(E)R, including that the EP complies with the OPGGS Act and the regulations. Consequently, NOPSEMA expects an EP that includes the removal of property etc. will address the requirements of section 572(3) and include: • a description of plans (including timeline) for the removal of all property etc. when it is neither used, nor to be used • an inventory of all property etc. in the title area, including a description, status and anticipated operational life (as per section 4.1 of this policy) • an evaluation of any direct or indirect impacts and risks of property etc. removal, including the management of waste • an appropriate level of detail for property etc. removal throughout the operations and proposed end state planning toward meeting removal requirements. Where titleholders propose alternative arrangements in relation to property etc. those arrangements must be accepted by NOPSEMA in an EP prior to the property etc. no longer being used (see section 6 of this policy).
Section 270 Consent to surrender title – NOPSEMA advice Document No: N-00500-PL1959 A800981	Policy	NOPSEMA	This document is an operational policy that explains key information required by NOPSEMA and the principles it has adopted when advising the Joint Authority (JA) on applications to consent to surrender a title (or where relevant, part thereof). This policy will assist titleholders to understand what NOPSEMA takes into account when considering if it is satisfied that titleholders have complied with the OPGGS Act and regulations (being the OPGGS Act regime) and the criteria in section 270(3)(b)(iii) & (v) and 270(3)(c) to (f) (the criteria) of the OPGGS Act. NOPSEMA expects titleholders to proactively consider the principles described in this policy when preparing permissioning documents. This will ensure NOPSEMA has had regard to these considerations in the course of exercising its functions and powers, prior to the surrender of titles process. In this way earlier certainty of outcomes can be obtained and regulatory burden reduced.

Document Name	Doc. Type	Author	Overview
			This policy may need to be amended depending upon the outcomes of the development and implementation of other Commonwealth decommissioning policies. NOPSEMA's regulatory policy continues to apply in the context of the existing legislative and administrative framework until that time.
Decommissioning Compliance Strategy 2024–2029 (Document No: A927433)	Strategy	NOPSEMA	This Strategy outlines the actions NOPSEMA will take to achieve its vision for decommissioning all petroleum wells, structures, equipment and property in Commonwealth waters. NOPSEMA is publishing this in the interests of transparency and in response to the Australian Government's Decommissioning Guideline and the Ministerial Statement of Expectations issued to NOPSEMA in 2022. All structures, equipment and property (including pipelines, platforms and all other subsea infrastructure) that forms part of a production system decommissioned to approved end-state as soon as reasonably practicable and no later than 5 years from that production system permanently ceasing production.
Considerations when Preparing for Decommissioning Activities (A818951)	Reference Material	NOPSEMA	An EP for decommissioning has the same content requirements and acceptance criteria as EPs for other offshore projects. For EPs proposing to leave property in situ additional information is required, to demonstrate relevant requirements have been satisfied. Further considerations for preparing an EP for decommissioning activities can also be found in the NOPSEMA document Considerations when Preparing for Decommissioning Activities.
Planning for Proactive Decommissioning (N-00500-IP2002 A816565)	Information paper	NOPSEMA	In response to the Decommissioning section of the Ministerial statement of expectations, the purpose of this information paper is to encourage titleholders to adopt good practice when planning for proactive decommissioning and to improve the maturity of their plans throughout the life cycle of a petroleum project. It will also provide information to assist with the timing of regulatory submissions and outline the level of detail expected in permissioning documents to demonstrate compliance with the OPGGS Act.
Ageing assets and life extension Document No: N-04300-GN1975 A783718	Guidance Note	NOPSEMA	The intent of this guidance note is to promote industry practices that ensure risks associated with ageing assets are managed to be as low as reasonably practicable. The purpose of this guidance note, is to identify sources of information on the subject, promote good practice based on lessons learned internationally, and putting this information into the legislative context of the OPPGGS Act.

Appendix C Santos' Values and Sensitivities of the Marine and Coastal Environment

Santos

REINDEER VALUES AND SENSITIVITIES OF THE MARINE AND COASTAL ENVIRONMENT

August 2024

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1. Introduction

1.1. Overview

Santos Ltd (Santos) is the titleholder of multiple petroleum titles for exploration, development, production and decommissioning activities located in marine waters off north-western Western Australia. This document describes the EMBA of the petroleum and greenhouse gas activities associated with the Reindeer wellhead platform (WHP) and Devil Creek Supply Pipeline in Commonwealth waters and includes details of the relevant values and sensitivities of that environment as required by the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.*

This document describes the EMBA of the petroleum and greenhouse gas activities associated with the Reindeer wellhead platform (WHP) and Devil Creek Gas Supply Pipeline (DC Supply Pipeline) in Commonwealth waters and includes details of the relevant values and sensitivities of that environment as required by the Commonwealth *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.*

The Reindeer Wellhead Platform and DC Supply Pipeline Operations and Cessation of Production (CoP) EP (the Reindeer EP) covers the operations and CoP phase of the Reindeer WHP and the Devil Creek Supply Pipeline in Commonwealth waters.

This document supports the Reindeer EP and describes the existing environment that may be affected (EMBA) by the Activity and includes details of the relevant values and sensitivities of that environment, as required by the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS (E) Regulations).

Section 3.1 of the Reindeer EP describes the EMBA and how it was determined for the proposed activities. It is important to note that the EMBA is used to identify the full range of environmental and socioeconomic receptors, however, it is not considered representative of potential ecological impacts (NOPSEMA, 2019).

This document is informed by the protected matters report (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023), stated values in the Marine Bioregional Plans for the North-West Marine Region (NWMR) (DSEWPaC, 2012a,b), published scientific literature and studies and information obtained through consultation. Marine and coastal species identified in the protected matters are described, with a focus on protected species that are threatened and migratory. It is important to note that this document describes the environmental values and sensitivities that occur within the boundaries of the EMBA, whereas the protected matters report incorporates an in-built buffer and hence may report on matters that are actually outside the EMBA.

1.2. Geographical Extent

The EMBA is located entirely within Australian coastal waters in north west Western Australia, and is located entirely within the North-West Marine Region (NWMR). The EMBA includes the coastal waters and shoreline habitats of Western Australia (WA). This area largely overlaps the Commonwealth North-West Marine Region (NWMR),. Based on the Integrated Marine and Coastal Regionalisation of Australia (IMCRA) Version 4.0 spatial framework, there are five provincial-scale bioregions that occur within the EMBA. These bioregions are based on the characteristics of fish assemblages, benthic habitats, and oceanographic data (IMCRA v. 4.0). Where relevant, the physical, biological, and social environments within the EMBA are discussed with reference to the IMCRA Provincial Bioregions. The bioregions within the EMBA (Figure 1) are:

North-west Marine Region

- Northwest Transition
- Northwest Province
- Northwest Shelf Province
- Central Western Transition
- Central Western Shelf Transition

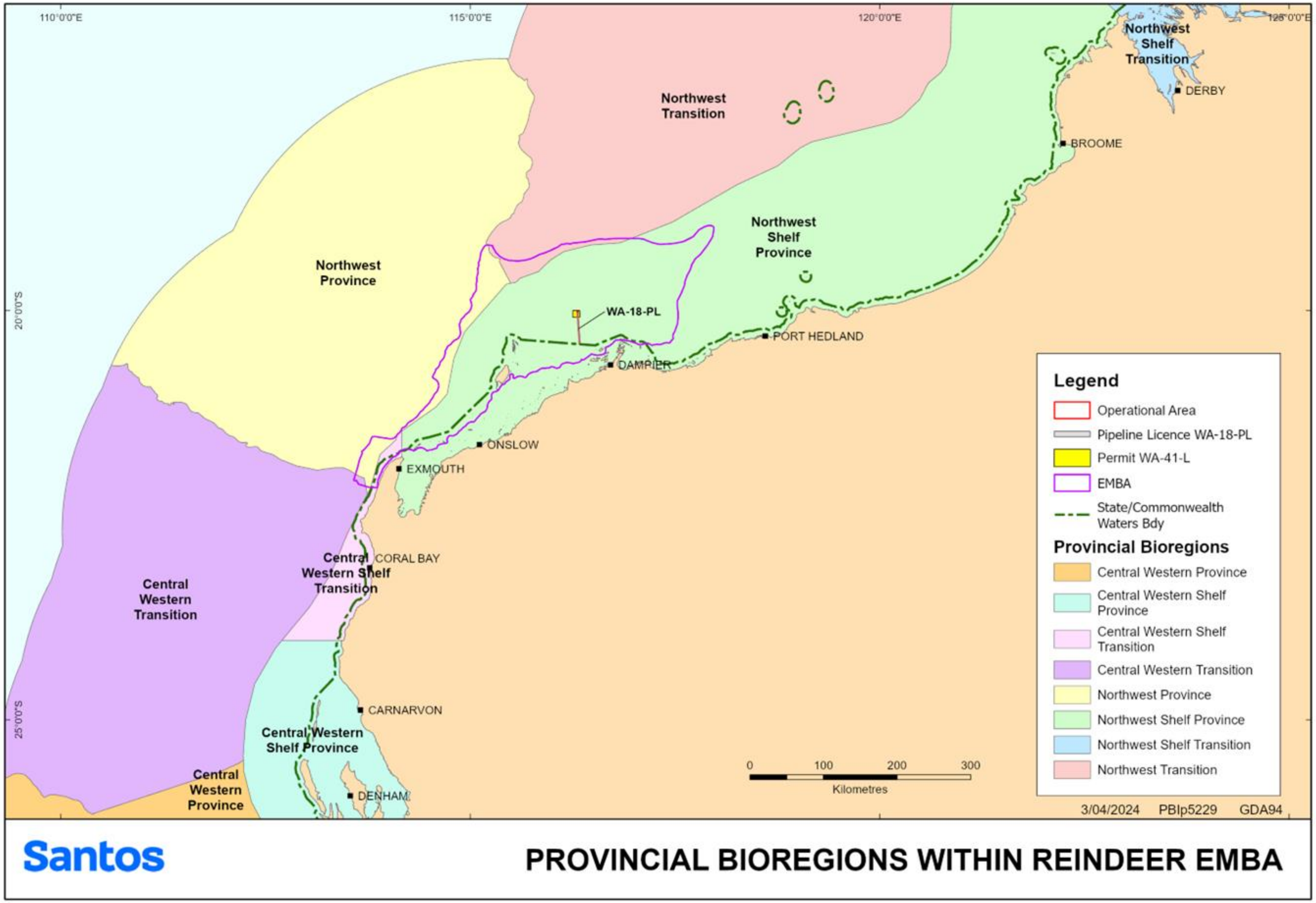


Figure 1: IMCRA 4.0 Provincial Bioregions within the EMBA

2. Physical Environment

2.1. Geomorphology

2.1.1. Formation History

Approximately 550–160 million years ago, the northern and western parts of the present-day Australian continent formed part of the northern margin of Gondwana. About 300 million years ago, crustal stretching, rifting and breakup initiated the development of an extensive basin that became the site for deposition of sediments (Baker et al. 2008 in Department of the Environment, Heritage, Water, and the Arts (DEWHA) 2008a). Approximately 135 million years ago the continent broke up resulting in the separation of greater India and Australia. Ocean spreading associated with the continental break-up resulted in the creation of the Argo and Cuvier abyssal plains. Subsidence of the rifted margin resulted in the formation of the Exmouth and Scott plateaux and the Rowley Terrace. The narrow shelf south of North West Cape was formed approximately 130 million years ago as a result of the separation of India and sea floor spreading (Baker et al. 2008 in DEWHA 2008a).

2.1.2. Present Day Geological Features

The EMBA consists of five major landform features: continental shelf, continental slope, continental rise, Exmouth plateau and abyssal plain. Most of the area consists of either continental shelf or continental slope (DEWHA 2008a).

Limited surveys have shown that the continental slope in the EMBA comprises diverse geological features such as canyons, plateaux, terraces, ridges, reefs, banks and shoals (DEWHA 2008a). These features are significant in that over half of the total area of banks and shoals across Australia's entire marine jurisdiction occurs in the Commonwealth waters from the South Australian border to the Northern Territory border, as well as 39 % of terraces and 56 % of deeps, holes and valleys (DEWHA 2008a).

An important characteristic of the EMBA is the significant narrowing of the continental shelf around North West Cape from the broad continental shelf in the north. For example, in the Joseph Bonaparte Gulf (at the NT boundary), the continental shelf is around 400 km wide, whereas at North West Cape the shelf is only 7 km wide – the narrowest of anywhere on the Australian continental margin (DEWHA 2008a). Shelf width affects oceanography with flow on effects to productivity and ecosystem functioning.

Several geomorphic formations within the EMBA have been associated with Key Ecological Features (DEWHA 2008a) and these are discussed in **Section 10**.

2.1.3. Central Western Transition

The Central Western Transition is characterised by large areas of continental slope, with sediments dominated by muds and sands that decrease in grain size with increasing depth. The slope is incised by numerous topographic features such as terraces (i.e. the Carnarvon Terrace), canyons (i.e. Cloates Canyon and Carnarvon Canyon) and rises. A large part of the bioregion consists of the Cuvier Abyssal Plain. The Wallaby Saddle is another important feature of this bioregion, and it is the most extensive area of this type of topographic feature in the North-west Marine Region (DEWHA, 2008a).

2.1.4. Central Western Shelf Transition

The Central Western Shelf Transition is located entirely on the continental shelf and is comprised mainly of sandy sediments. The close proximity of the coast to the shelf break is a significant feature of this bioregion and is an important factor in determining its biodiversity (DEWHA, 2008a).

Ningaloo Reef is the most significant geomorphic feature in the bioregion. It extends south of North West Cape along the Cape Range Peninsula, and stretches for over 260 km. It is the only example in the world of an extensive fringing coral reef on the west coast of a continent (DEWHA, 2008a).

2.1.5. Northwest Province

The bioregion occurs entirely on the continental slope and is comprised of muddy sediments. It is distinguished by a number of topographic features, such as the Exmouth Plateau, terraces and canyons (including the Swan and Cape Range canyons), as well as deep holes and valleys on the inner slope. The Montebello Trough occurs on the eastern side of the Exmouth Plateau and represents more than 90 per cent of the area of troughs in the North-west

Marine Region. Significantly, this bioregion contains the steepest shelf break of the North-west Marine Region, along the Cape Range Peninsula near Ningaloo Reef (DEWHA, 2008a).

2.1.6. Northwest Transition

The majority (52 %) of the Northwest Transition bioregion occurs on the continental slope, with smaller areas in the north-west of the bioregion located on the Argo Abyssal Plain and continental rise. The sediments of the slope are dominated by sands, whereas the sediments of the abyssal plain/deep ocean floor are dominated by muds. More than 60 % of the Argo Abyssal Plain occurs within this bioregion and much of the Northwest transition occurs in water over 4,000 m deep (DEWHA, 2008a).

Other topographic features within the bioregion include areas of rise, ridges, canyons and apron/fans. The bioregion also has reefs such as Mermaid, Clerke and Imperieuse reefs, which are collectively known as the Rowley Shoals (DEWHA, 2008a).

2.1.7. Northwest Shelf Province

The Northwest Shelf Province is located almost entirely on the continental shelf, except for a small area to the north of Cape Leveque that extends onto the continental slope. This bioregion includes more than 60 % of the continental shelf in the North-west Marine Region (DEWHA, 2008a). The shelf gradually slopes from the coast to the shelf break but displays a number of sea floor features such as banks/shoals and holes/valleys. These are thought to be morphologically distinct from other features of these types found elsewhere in the North-west Marine Region, and have a different sedimentology (DEWHA, 2008a). For example, the Glomar Shoals occur approximately 30–40 km offshore of Dampier in water depths of between 26–70 m and are distinguished by highly fractured molluscan debris, coralline rubble, and coarse carbonate sand. The province also includes the Leveque Rise, a large plateau, and one of only two shelf plateaux within the North-west Marine Region (DEWHA, 2008a).

2.1.8. Sediments

Terrestrial environments are not a major source of sediment to the EMBA and terrigenous sediments tend to be confined to the inner shelf (generally less than 100 m water depth), particularly in areas adjacent to rivers. Sediments in the area generally become finer with increasing water depth, ranging from sand and gravels on the shelf to mud on the slope and abyssal plain.

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. Internal tides describe the tidal movement across a slope of water stratified by marked differences in density. Internal tides cause resuspension and net down-slope deposition of sediments on the North West Shelf (DEWHA 2008a).

Surveys conducted over the North West Shelf indicate that similar sediments occur extensively over this geographic region, but with spatial variation in the grain size and origin of the surface sediments.

Shoals and banks are naturally forming, submerged and made of consolidated material such as sand. Normally, the shoal or bank rises close to the water surface having been created when an ocean current deposits sediment. Shoals and banks are found within the EMBA. Glomar shoal is the only shoal within the EMBA that is listed as a Key Ecological Feature and is discussed along with several other geomorphic formations (DEWHA 2008a) in **Section 10**.

2.2. Climate

Waters in northern Western Australia predominantly lie in the arid tropics, experiencing high summer temperatures and periodic tropical cyclones in summer. Rainfall in the region is low, although intense rainfall may occur during the passage of summer tropical cyclones and thunderstorms (Condie et al. 2006). Mean air temperatures range from a minimum of 11°C in winter to a maximum of 36°C in summer (Condie et al. 2006). Due to the arid climate, daytime visibility in the area is generally greater than 5 nautical miles (SSE 1991).

The summer and winter seasons fall into the periods September–March and May–July, respectively. Winters are characterised by clear skies, fine weather, predominantly strong east to southeast winds and infrequent rain (calculated from the National Centres for Environmental Prediction and National Centre for Atmospheric Research (NCEP-NCAR) dataset measured from 1982 to1999; Condie et al. 2006; **Figure 2**).

Summer winds are more variable, with strong south-westerlies dominating. Transitional wind periods, during which either pattern may predominate, can be experienced in April–May and September of each year.

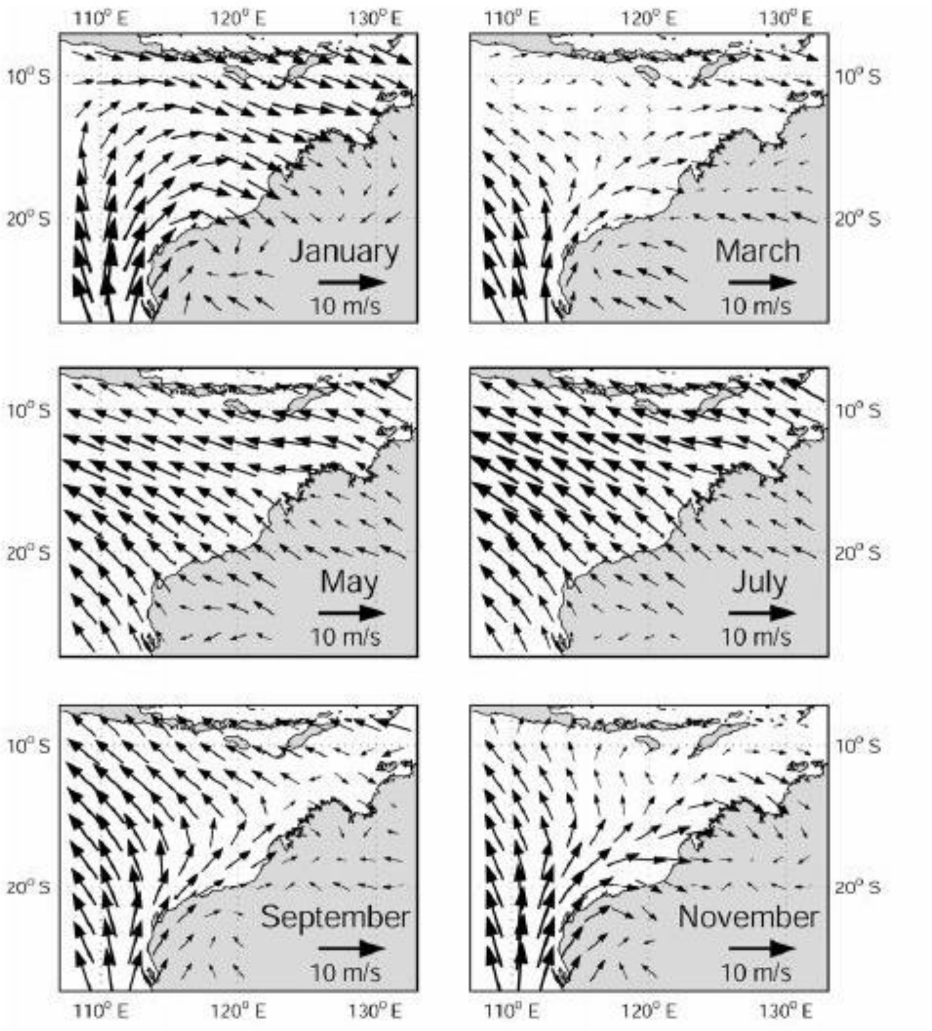


Figure 2: Seasonally averaged winds at 10 m above mean sea level

Calculated from NCEP-NCAR dataset measured from 1982 to 1999. Source: Condie et al. (2006)

Tropical cyclones generate the most significant storm conditions in the area (SSE 1993). These clockwise-spiralling storms have generated wind speeds 50–120 knots (SSE 1991). Tropical cyclones develop in the eastern Indian Ocean, and the Timor and Arafura Seas during the summer months. Three to four cyclones per year are typical, with the official cyclone season being November through to April (Bureau of Meteorology (BoM) 2013).

2.3. Oceanography

Major drivers of marine ecosystems include ocean currents, tides, waves, temperature and salinity. The dominant offshore sea surface current is the Leeuwin Current (**Figure 3**), which carries warm tropical water south along the edge of Western Australia's continental shelf, reaching its peak strength in winter and becoming weaker and more variable in summer (Condie et al. 2006). The current is typically located seaward of the shelf break (200 m isobath) and is a narrow, surface current, extending to a depth of 150 m (BHPB 2005, Woodside 2005) and a width of 50–100 km (DEWHA 2008a). The strength of the Leeuwin Current is influenced by seasonal variability in the pressure gradient (DEWHA 2008a). The Holloway Current is the prevailing seasonal current, travelling south-west along the north West Australian coast in winter and north-east in summer (Brewer et al. 2007). It is a relatively narrow boundary current that flows along the north-west shelf at between 100 m and 200 m depth, flowing towards the north-east in summer and the south-west in winter (Fugro, 2015).

The Indonesian Throughflow is the other important current influencing the upper 200 m of the outer North West Shelf (Woodside 2005). This current brings warm and relatively fresh water to the region from the western Pacific via the Indonesian Archipelago (**Figure 3**). Modelling undertaken by Woodside and Commonwealth Scientific and Industrial Research Organisation (CSIRO) Marine and Atmospheric Research indicates that significant east–west flows occur across the North West Shelf to the north of the North West Cape, possibly linking water masses in the area (Woodside 2005, Condie et al. 2006).

Currents in the coastal zone and over the inner to mid-shelf are largely driven by tides and winds, whereas offshore, over the continental shelf, slope and rise are influenced by large scale regional circulation (DEWHA 2008a).

The nearshore Ningaloo Current flows northwards opposite to the Leeuwin Current, along the outside of the Ningaloo Reef and across the inner shelf from September to mid-April (BHPB 2005, Woodside 2005). The nearshore Capes Current, which is to the south of the Ningaloo Current, is a seasonal current that appears strongest between Cape Leeuwin and Cape Naturaliste, in the southwest of Western Australia (Pearce and Pattiaratchi 1999). Strong northwards winds between November and March slow the Leeuwin Current and increase the strength of the Capes Current. Localised upwelling is also known to occur in the area (Pearce and Pattiaratchi 1999).

Tides increase in amplitude from south to north, corresponding with the increasing width of the shelf (Holloway 1983). Tides in the area are generally semi-diurnal (i.e. two high tides and two low tides per day) with a spring/neap cycle.

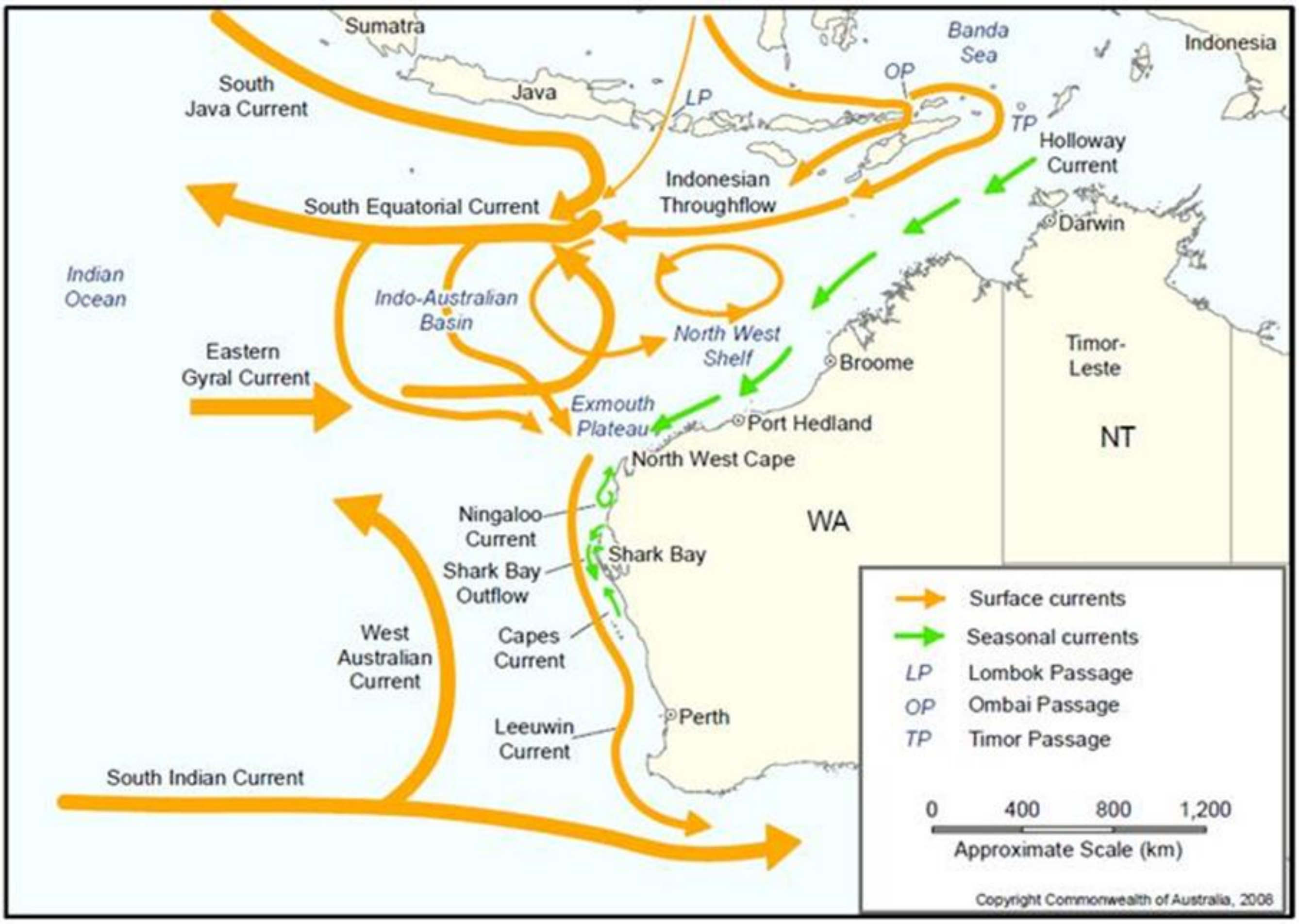
The wave climate in the northwest is composed of locally-generated wind waves (seas) and swells that are propagated from distant areas (WNI 1995). In summer the seas typically approach from the west and southwest, while in winter the seas typically approach from the south and east. Mean sea wave heights are typically less than 1 m and peak heights of less than 2 m are experienced in all months of the year (WNI 1995).

Average swell heights are low, around 0.4–0.6 m in all months. The greatest exposure to swells is from the west (SSE 1993). Tropical cyclones have generated significant swell heights of up to 5 m in this area, although the predicted frequency of swells exceeding 2 m is less than 5% (WNI 1996). In the open ocean, sustained winds result in wind-forced currents of approximately 3% of the wind speed (Holloway & Nye 1985).

Waters on the continental shelf are usually thermally-stratified, with a marked change in water density at approximately 20 m (SSE 1993). Surface temperatures vary annually, being warmest in March (32°C) and coolest in August (19°C). Vertical gradients are related to the seasonality of sea surface temperatures and are greatest during the warm-water season (SSE 1991). Near-bottom water temperature on the North West Shelf is approximately 23°C, with no discernible seasonal variation.

Salinity is relatively uniform at 34–35 ppt throughout the water column and across the North West Shelf. Due to the low rainfall there is little freshwater run-off from the adjacent mainland (Blaber et al. 1985).

Pronounced shifts in water column characteristics can occur following the passage of tropical cyclones (McKinnon et al. 2003). Changes in water temperature and salinity characteristics can result from changes in local heating and evaporation following the southward movement of warmer water due to southward-moving cyclones and can have flow-on effects to primary and secondary productivity (McKinnon et al. 2003).



Source: DEWHA (2008b)

Figure 3: Surface currents WA

3. Benthic and Pelagic Habitats

Benthic habitats are defined as those subtidal habitats lying below the lowest astronomical tide (LAT). Benthic habitats are partially driven by light availability. Primary producers (photosynthetic corals, seagrasses and macroalgae) are limited to the photic zone, whereas benthic invertebrates including filter feeding communities may be found in deeper waters. The depth of the photic zone varies spatially and temporally and is predominantly dependent on the volumes of suspended material in the water column. The photic zone in the offshore Pilbara is approximately 70 m whereas in oceanic waters in the northwest the photic zone may extend to 120 m (DEWHA 2008b).

The following section broadly categorises benthic habitats as four biological communities: coral, seagrasses, macroalgae and non-coral benthic invertebrates. These communities are discussed in terms of the 5 IMCRA v. 4.0 bioregions. Some broad scale benthic habitat mapping exists for the Northwest and Central Western Shelf Provinces and this is shown in **Figure 4**.

3.1. Coral Reefs

Corals are both primary producers and filter feeders and thus play a role in the provision of food to marine fauna and in nutrient recycling to support ecosystem functioning (Conservation and Land Management (CALM) & Marine Parks and Reserves Authority (MPRA) 2005a).

Corals create settlement substrate and shelter for marine flora and fauna. Studies have shown that declines in the abundance, or even marked changes in species composition of corals, has a marked impact on the biodiversity and productivity of coral reef habitats (Pratchett et al. 2008). As part of the reef building process, Scleractinian corals are also important for protection of coastlines through accumulation and cementation of sediments and dissipation of wave energy (CALM & MPRA 2005a).

The waters in the EMBA contain extensive coral communities. Coral reefs in the area fall into two general groups: the fringing reefs around coastal islands and the mainland shore; and large platform reefs, banks and shelf-edge atolls offshore (Woodside 2011). The distribution of corals is governed by the availability of hard substrate for attachment and light availability.

Coral reefs are dynamic environments that regularly undergo cycles of disturbance and recovery. Depending on how frequent and severe the disturbances are, recovery can take a few years or more than a decade. Disturbances can include bleaching, cyclones and disease outbreaks (Australian Institute of Marine Science (AIMS) 2011).

Corals in the northwest and central provinces have experienced bleaching events and subsequent recovery. Bleaching is the process where symbiotic algae are expelled from the coral tissue, often leading to the death of the colony. Causes of bleaching include high temperatures (Ningaloo; 2011 and Scott Reef; 1998 and 2016) (information available at AIMS.gov.au), anoxic conditions (Bill's Bay; 2008) or smothering (Waples & Hollander 2008, Gilmour et al. 2013). Coral susceptibility to bleaching and their ability to recover is an important consideration in the context of potential anthropogenic impacts.

Two bioregions (Northwest Province and Central Western Transition) lie in deep waters below the photic zone Coral reefs are not present hence these bioregions are not discussed further.

3.1.1. Central Western Shelf Transition

A significant proportion of this bioregion is covered by the Ningaloo Reef. The Ningaloo Reef is unique in that it is the largest fringing reef in Australia and is the only large reef found on the western side of a continent in the southern hemisphere.

A 300 km section of the coast, from Red Bluff to North West Cape and extending to Bundegi in Exmouth Gulf, is included in the Ningaloo Marine Park. Ningaloo Reef supports variable lagoonal, intertidal and subtidal coral communities along its length. Ningaloo Reef is characterised by a high diversity of hard corals with at least 217 species representing 54 genera of hermatypic (reef building) corals recorded to date (Veron & Marsh 1988). The most diverse coral communities are found in the shallow relatively clear water, high energy environment of the fringing barrier reef and low energy lagoonal areas to the west of North West Cape (CALM & MPRA 2005a).

Coral diversity reduces with increasing depth, and corals are uncommon at depths greater than 40 m (Waples & Hollander 2008). At depths between 20 and 30 m hard corals have been found to be more dominant in the northern areas of the Ningaloo Marine Park, whereas in southern areas other sessile invertebrates such as sponges, are more prevalent (Waples & Hollander 2008).

3.1.2. Northwest Transition

This bioregion lies mostly over the continental slope and the abyssal plain in deep waters that preclude photosynthetic coral growth (DEWHA 2008a). However, in contrast with the surrounding area, the Rowley Shoals are three distinct reef systems (Mermaid, Clerke and Imperieuse Reefs) approximately 30–40 km apart that rise vertically to the surface from depths of between 500 and 700 m. The marine reef fauna of the Rowley Shoals is considered to be exceptionally rich and diverse, including species typical of the oceanic coral reef communities of the Indo-West Pacific. As many of these species are not found in the inshore tropical waters of northern Australia, such populations are of regional significance (DEWHA 2008a).

A 1993 survey at Mermaid Reef recorded 214 species of scleractinian corals (Done et al. 1994) which is comparable to a more recent survey recording 211 species, including 22 new distribution records (McKinney 2009). The Rowley Shoals system has maintained high coral cover and has not been impacted by mass bleaching, despite neighbouring bleaching events reported at Scott reef during 1998 and 2016 (Gilmour et al*., 2021*). Since 1997, mean coral cover has increased through periods of impact and recovery from cyclones, reaching the highest (71%) on record in 2017 (Gilmour et al. 2019). The survey found that coral assemblages of the Rowley Shoals are broadly comparable to those found on the reefs of the outer Great Barrier Reef and in the Coral Sea. While the coral fauna is similar to Scott Reef, it differs considerably from that of north-western Australia (Veron 1986). Veron (1986) notes that the clear water of the Rowley Shoals allows coral communities to exist over a great range of depths, while the strong wave action on the outer coral slopes and the wide tidal range result in distinct patterns of zonation.

Recent genetic studies have also shown distinct genetic differences between offshore reef systems, the inshore macrotidal Kimberley region and Ningaloo Coast World Heritage Area reefs (Adam et al. 2022, Gilmour et al. 2016, Underwood 2009, Underwood et al. 2020). This is likely a result of their isolation, with negligible supply of larva from other reefs (Adam et al. 2022, Thomas et al. 2017). These studies highlight the importance of local recruitment in offshore reef systems in order to maintain healthy coral populations, which may reduce their capacity to adapt to rapid environmental change.

3.1.3. Northwest Shelf Province

This province contains numerous small coastal islands in addition to larger archipelago and offshore island groups. Many of these features are surrounded by shallow waters with small barrier and fringing reefs that support coral communities. Key areas recognised for coral communities in this bioregion are discussed below.

The Dampier Archipelago supports coral reefs in shallow waters near islands and submerged pinnacles. The most significant coral reefs have formed along the seaward slopes of Delambre Island, Hamersley Shoal, Sailfish Reef, Kendrew Island and north-west Enderby Island (CALM & MPRA 2005b). Field trips in the Dampier Archipelago between 1972 and 1998 recorded 229 species of corals from 57 genera (Griffith 2004). Surveys of the Dampier Port and inner Mermaid Sound recorded approximately 120 coral species from 43 genera (Blakeway & Radford 2005) with coral reefs dominated by acroporids and pocilloporids. The greatest coral cover (up to 70%) was recorded in the eastern half of the archipelago (Wells et al. 2003).

The Montebello, Lowendal and Barrow islands include 315 islands associated with extensive coral reefs, the most significant of which occur in the sheltered waters on the eastern side of the islands. Examples of these significant reefs include Dugong Reef, Batman Reef and reefs along the Lowendal Shelf (DEC & MPRA 2005a). Dominant corals include acroporids and poritids, with greater than 70% cover recorded for some areas (Chevron 2010). Subtidal coral reef communities around the islands are highly diverse, with at least 150 species of hard corals recorded from fringing and patch coral reef areas (DEC & MPRA 2007a).

Coral distribution near the mainland is restricted by lack of light due to natural turbidity. Corals may exist as sparse coral colonies in some locations, rather than extensive coral communities. Within Exmouth Gulf, coral communities are less common but are present on fringing reefs surrounding islands, as solitary corals distributed across areas of hard substrate, or on larger isolated patch reefs.

An epibenthic dredge survey of nearshore areas north of Broome identified 14 species of hard corals from six families (Keesing et al. 2011). Limited coral surveys conducted at Broome (15 species) and the Lacepede Islands (ten species) (Veron & Marsh 1988) suggest the species diversity in this locality may be low. However, low species diversity observed during the dredge survey may reflect the limited sampling frequency, limited depth range (11–23 m) or inadequate sampling in habitats considered favourable for the proliferation of hard corals (hard substrate). In contrast, other surveys of nearshore locations in the region have recorded much higher levels of species diversity. Veron and Marsh (1988) stated that 102 species of hard corals have been recorded from the Kimberley coast and nearshore reefs and Cairns (1998) recorded 87 species of azooxanthellate hard coral species from north-western Australian waters.

3.2. Seagrasses

Seagrasses are biologically important for four reasons:

- As sources of primary production
- As habitat for juvenile and adult fauna such as invertebrates and fish
- As a food resource
- For their ability to attenuate water movement and trap sediment (Masini et al. 2009).

Twenty-five species of seagrass have been recorded in WA, the highest diversity in the world, and over 30 species of seagrasses have been recorded as occurring within Australian waters (Masini et al. 2009). Waters extending from Busselton to the NT border support predominantly tropical species although temperate species are also found, particularly between Busselton and Exmouth (Walker & Prince 1987). One species, *Cymodocea angustata*, is endemic to WA (Department of Parks and Wildlife (DPAW) 2013).

The main seagrasses of the northern region of the EMBA are small, ephemeral species that grow on soft sediments and have a seed bank in the surficial sediments that allows them to recover quickly from disturbance (Walker 1989). Small, ephemeral species of seagrass tend to form mixed associations with macroalgae (CALM & MPRA 2005, DEC & MPRA 2007a, BHPBIO 2011) and usually cover less than 5% of the substrate (BHPBIO 2011, van Keulen & Langdon 2011). Areas occupied by these seagrass species vary markedly both seasonally and interannually and it is not clear why some areas of suitable substrate will support seagrass in one year but not the next. It appears that recruitment to what may otherwise be suitable substrate is haphazard, lending weight to the descriptions of these seagrass communities as ephemeral (CALM & MPRA 2005a, DEC & MPRA 2007a).

Two bioregions (Northwest Province, Central Western Transition) lie entirely in deep waters below the photic zone. Seagrasses are not present hence these bioregions are not discussed further.

3.2.1. Central Western Shelf Transition

Nine species of seagrasses have been found throughout Ningaloo Reef (van Keulen & Langdon 2011). Some delineation of temperate and tropical species exists; however, several species were found throughout the Ningaloo Reef. *Halophila ovalis* was the most commonly found seagrass at Ningaloo and was generally found growing in sandy patches between coral bomboras. *Amphibolis antarctica* is a large meadow forming species that has been found growing in large clumps in Bateman Bay, north of Coral Bay (van Keulen & Langdon 2011).

3.2.2. Northwest Transition

The Rowley Shoals provide the only suitable shallow substrate for seagrasses in this predominantly deep bioregion. Sparse seagrass is found within subtidal coral reef communities of the Rowley Shoals but is not a major habitat type. Two species of seagrass, *Thalassia hemprichii* and *Halophila ovalis*, have been recorded at Mermaid Reef (Huisman et al. 2009). Earlier studies at Mermaid and Imperieuse Reef recorded the above two species and a third species: *Thalassodendron ciliatum* (Walker & Prince 1987).

3.2.3. Northwest Shelf Province

In the Northwest Shelf Province, seagrasses are present but sparsely distributed to depths of approximately 30 m (LEC & Astron 1993, URS 2009, CALM 2005a). The abundance and distribution of tropical (and subtropical) seagrass species can vary greatly due to seasonal changes in water quality (turbidity, light penetration) and conditions (wave action, temperature), with biomass tending to peak in summer (Lanyon & March 1995).

Studies between Quondong and Coulomb Points north of Broome identified seagrass communities of *Halophila* spp. patchily distributed across large areas, from the lower intertidal and out to a depth of approximately 20 m (DEC 2008, Fry et al. 2008). Similarly, *Halophila decipiens* was the only seagrass collected from epibenthic dredge studies at five localities near Broome from Gourdon Bay to Packer Island (Keesing et al. 2011).

Roebuck Bay is located south of Broome and includes large areas of intertidal mudflats. Extensive seagrass meadows occur in the northern regions of Roebuck Bay and are dominated by *Halophila ovalis* and *Halodule uninervis*. *Halophila minor* and *Halodule pinifolia* have also been reported at this location (Prince 1986, Walker & Prince 1987, Seagrass-Watch 2019).

In the Dampier Archipelago seagrass occurs in the larger bays and sheltered flats of the area (CALM & MPRA 2005b). Six species of seagrass, including three Halophila species, have been recorded on the subtidal soft sediment habitats (CALM & MPRA 2005b). Seagrasses do not form extensive meadows within the proposed reserves, but rather form interspersed seagrass/macroalgal beds. The largest areas of seagrass are found between Keast and Legendre islands, and between West Intercourse Island and Cape Preston (CALM & MPRA 2005).

Surveys near Onslow found that *Halophila* spp. were the most widespread of the seagrasses in that region. Seagrasses were found to be generally sparsely distributed (<10 % cover), occurring in small patches within larger areas of suitable substrate. Small areas of higher (>50 %) seagrass cover occurred in shallow clear water areas but were not common (URS 2009, URS 2010b, Chevron 2010).

Similarly, in the Montebello/Barrow Islands Marine Conservation Reserves, seagrasses appear not to form extensive meadows but are sparsely interspersed between macroalgae. Seven seagrass species have been recorded in the Reserves (DEC & MPRA 2007a) with *Halophila* spp. the most common seagrass species on shallow soft substrates and sand veneers. Distributions of these species extend from the intertidal zone to approximately 15m water depth (DEC & MPRA 2007a). Surveys to the northwest and southeast of Barrow Island from 2002 to 2004 did not identify any significant seagrass meadows but confirmed the presence of sparse coverage of *Halophila* and *Halodule* spp. in shallow areas east of Barrow Island (RPS BBG 2005).

A significant meadow of large seagrasses at Mary Anne Reef east of Onslow was identified almost 30 years ago and its presence today is unconfirmed. The meadow was several hundred hectares (ha) of *Cymodocea angustata* at 30–50 % cover, occurring primarily at a depth of 2–3 m (Walker & Prince 1987).

3.3. Macroalgae

Macroalgae are important contributors to primary production and nutrient cycling in the EMBA, providing food and habitat for vertebrate and invertebrate fauna. Macroalgae are also recognised for their role in spatial subsidies; the movement of nutrients or energy between neighbouring habitats. Spatial subsidies involving macroalgae include the movement of wrack from macroalgal beds to seagrass meadows, bare substrates and shorelines (Orr 2004, Mellbrand et al. 2011).

Macroalgae are primarily associated with hard substrates. They occur in moderate to high cover on exposed hard substrates, but typically have lower cover on hard substrates that are covered with a veneer of sediment (SKM

2009b, BHPBIO 2011). Macroalgae exhibit very high seasonal and interannual variation in biomass (Heyward et al. 2006) and distribution, abundance, and biodiversity (Rio Tinto 2009, BHPBIO 2011). The distribution of hard substrates therefore indicates areas that may support macroalgal communities, although abundance and diversity may fluctuate annually.

Macroalgae are susceptible to disturbance from factors such as sedimentation, scouring and turbidity but the marked seasonality in biomass, abundance, diversity, and distribution suggests macroalgae are likely to be resilient to acute, short-term disturbance acting at local scales. Macroalgae may be more susceptible to impacts acting over longer time scales (years) and at certain times of the year, where recruitment at a regional scale could be affected. Indirect impacts affecting the numbers, distribution and community structure of herbivorous fish can also be expected to have impacts (either positive or negative) on macroalgal habitats (Vergès et al. 2011).

Two bioregions (Northwest Province and Central Western Transition) lie entirely in deep waters below the photic zone. Macroalgae are not present hence these bioregions are not discussed.

3.3.1. Central Western Shelf Transition

Macroalgal beds along the Ningaloo coastline are generally found on the shallow limestone lagoonal platforms and occupy about 2,200 ha of the Ningaloo Marine Park and Muiron Islands Marine Management Area (CALM & MPRA 2005a). Macroalgal communities within the area have been broadly described (Bancroft & Davidson 2000). The dominant genera are the brown algae *Sargassum*, *Padina*, *Dictyota* and *Hydroclathrus* spp. (McCook et al. 1995).

3.3.2. Northwest Transition

Although macroalgae is present at the Rowley Shoals, it is not recognised as a key habitat component in the Mermaid Reef Marine National Nature Reserve Plan of Management (EA 2000) or the Rowley Shoals Marine Park Management Plan (DEC & MPRA 2007b).

There is nothing to suggest that the algal flora of the Rowley Shoals is unique within the Indo-Pacific (Huisman et al. 2009). A study of macroalgae at 16 locations at Mermaid Reef recorded over 100 species (Huisman et al. 2009). The algal flora recorded at the Rowley Shoals represents a small portion of the highly diverse Indo-Pacific flora. The majority of species that were recorded at Mermaid Reef had been previously recorded from mainland north-western Australia or from Indonesia (Huisman et al. 2009).

3.3.3. Northwest Shelf Province

Macroalgae are diverse and widespread throughout the Northwest Shelf Province. They are restricted to depths where sufficient light penetrates to the substrate and therefore tend to be most common in shallow subtidal waters down to approximately 20 m depth.

In the nearshore regions of the Pilbara, macroalgae are often a dominant component of the mosaic of benthic organisms found on hard substrates in shallow water. In these shallow waters, regular disturbance to reef habitats from seasonal changes in sedimentation/ erosion patterns and the less frequent impacts of cyclones and storms through sedimentation and scouring may substantially alter the distribution and composition of the benthic communities associated with reefs, including macroalgal habitats (BHPBIO 2011).

Macroalgae dominate shallow (<10 m) submerged limestone reefs and also grow on stable rubble and boulder surfaces in the Dampier Archipelago (CALM & MPRA 2005b). Huisman and Borowitzka (2003) reported approximately 200 species of macroalgae from the Dampier Archipelago. Low relief limestone reefs that are dominated by macroalgae, account for 17 % (approximately 35,460 ha) of the marine habitats within the proposed Marine Management Area (CALM & MPRA 2005a).

Epibenthic dredge surveys along the coastline north of Broome identified 43 species of algae from 22 families (Keesing et al. 2011). The lower species diversity collected by this study is attributed to the method of collection and limited depth range (11–23 m) (Keesing et al. 2011).

Macroalgae occur around the numerous small offshore islands within this bioregion (including Thevenard Island, Airlie Island and Serrurier Island) associated with limestone pavement and protected areas of soft sediments. Dominant species are consistent with those described for the Dampier Archipelago (Woodside 2011).

In the shallow offshore waters of the Pilbara region, macroalgae are the dominant benthic habitat on hard substrates in both the Montebello and Barrow Islands Marine Parks and are the main primary producers (DEC & MPRA 2007a, Chevron 2010). Shallow water habitats outside these marine parks are also likely to support substantial areas of macroalgal habitat wherever conditions are suitable.

Macroalgae occupy approximately 40% of the benthic habitat area in the Montebello/ Lowendal/ Barrow Island region (CALM & MPRA 2005b). At least 132 macroalgal taxa occur around Barrow Island, with most thought to be widely distributed in the tropical Indo-Pacific region (Chevron 2005).

Macroalgae monitoring around the Lowendal and Montebello Islands since 1996 (The Ecology Lab 1997, IRCE 2002 2003 2004 2006 2007, URS 2009) has found macroalgal cover and biomass to be naturally spatially and temporally variable. *Sargassum* spp. represented 70% of the macroalgal assemblage in 2009, compared to 96% in 2002 (URS 2009). Sargassum spp. cover as a percentage of total macroalgae cover was significantly lower in 2009 than in previous years, primarily due to an increase in filamentous algae at a number of sites (URS 2009).

3.4. Non-Coral Benthic Invertebrates

The offshore marine environment from Busselton to the Northern Territory is overwhelmingly dominated by soft sediment seabeds; sandy and muddy substrates, occasionally interspersed with hard substrates covered with sand veneers, and rarely, exposed hard substrate. In shallow waters, non-coral benthic invertebrates may form part of the mosaic of benthic organisms found on hard substrates, alongside macrophytes and coral colonies. As light reduces with water depth, non-coral benthic invertebrates are the dominant community, albeit at low densities.

Non coral benthic invertebrates feed by filtering small particles from the seawater, typically by passing the water over a specialised filtering structure. Examples of filter feeders are sponges, soft and whip corals and sea squirts.

3.4.1. Central Western Transition

The Central Western Transition extends from the shelf break to the continental slope with some parts of the bioregion occurring on the abyssal plain. Water depths range from 80 m to almost 6,000 m. Sediments are dominated by muds and sands that decrease in grain size with increasing depth. The present level of understanding of the marine environment in this bioregion is generally poor. The harder substrate of the slope in waters of 200–2,000 m deep is likely to support populations of epibenthic fauna including bryozoans and sponges. These support larger infauna and benthic animals such as crabs, cephalopods, echinoderms and other filter feeding epibenthic organisms. In the deeper waters of the abyss, the benthic communities are likely to be sparse (DEWHA 2008a).

3.4.2. Central Western Shelf Transition

The Central Western Shelf Transition is located entirely on the continental shelf and is comprised mainly of sandy sediments in depths between 0 and 80 m (DEWHA 2008a).

Some sponge species and filter-feeding communities found in deeper waters offshore from the Ningaloo Reef appear to be significantly different to those of the Dampier Archipelago and Abrolhos Islands, indicating that the Commonwealth waters have some areas of potentially high and unique sponge biodiversity (Rees et al. 2004).

3.4.3. Northwest Province

The Northwest Province is located entirely on the continental slope in water depths of predominantly between 1,000–3,000 m and is comprised of muddy sediments. Despite the present poor knowledge of the benthic communities on the Exmouth Plateau, information on sediments in the bioregion indicates that benthic communities are likely to include filter feeders and epifauna. Soft-bottom environments are likely to support patchy distributions of mobile epibenthos, such as sea cucumbers, ophiuroids, echinoderms, polychaetes and sea pens.

3.4.4. Northwest Transition

The Northwest Transition is located from the shelf break (200 m water depth) over the continental slope to depths of more than 1,000 m at the Argo Abyssal Plain. Benthic habitat mapping surveys and epibenthic sampling conducted by CSIRO at the continental slope (approximately 400 m water depth) showed that all survey sites predominantly comprised soft, muddy sediment, which was often riffled. Gravel, boulders and small outcrops were occasionally recorded. Epifaunal abundance was similar all sites, with epifauna limited to sparsely distributed isolated individuals. Epifauna included isolated scattered sessile crinoids, anemones, glass sponges and seapens. Occasional non-sessile fauna included urchins, prawns and other decapods, holothurians and sea stars. Modelling indicated a 1 km long beam trawl across the continental shelf (approximately 400 m water depth) would be expected to yield sparse (<20 individuals) and low diversity (<10 species) of epibenthic fauna (≥1 cm body size) (Williams et al. 2010). Deeper on the continental slope at approximately 700 m and approximately 1,000 m, habitats were similar to those observed at 400 m (Williams et al. 2010).

Although soft sediment habitat may appear monotonous and featureless, there is likely to be some marked differences in terms of ecological functioning and faunal composition between shelf and deep-sea areas, with the

200 m isobath widely believed to represent a key boundary (Wilson 2013, Brewer et al. 2007, Gage & Tyler 1992). Beyond the 200 m isobath, deep-sea benthic communities rely exclusively on the settling of organic detritus from the overlying water column as a food source. The spatial and temporal distribution of benthic fauna depends on factors such as sediment characteristics, depth and season (Wilson 2013).

Due to contrasting depths, the Rowley Shoals supports a diverse marine invertebrate community including a number of endemic species. Invertebrate species (excluding corals) at the Rowley Shoals include sponges, cnidarians (jellyfish, anemones), worms, bryozoans (sea mosses), crustaceans (crabs, lobsters, etc.), molluscs (cuttlefish, baler shells, giant clams, etc.), echinoderms (starfish, sea urchins) and sea squirts (DEC & MPRA 2007b).

3.4.5. Northwest Shelf Province

This bioregion is located primarily on the continental shelf in water depths from 0 to 200 m (DEWHA 2008a). The sandy substrates on the shelf within this bioregion are thought to support low density benthic communities of bryozoans, molluscs and echinoids (DEWHA 2008a). Sponge communities are also sparsely distributed on the shelf but are found only in areas of hard substrate. The region between Dampier and Port Hedland has been described as a hotspot for sponge biodiversity (Hooper & Ekins 2004).

Epibenthic dredge surveys in nearshore areas around Broome covered 1,350 m^2 of seabed in depths between 11 and 23 m. The survey recorded 357 taxa comprising 52 sponges, 30 ascidians, 10 hydroids, 52 cnidarians (not including scleractinian corals), 69 crustaceans, 73 molluscs and 71 echinoderms. The most important species on soft bottom habitats in terms of biomass was the heart urchin *(Breynia desorii)*, whilst sponges were the dominant fauna by biomass on hard bottom habitats. The biomass of other filter feeders, especially ascidians, soft corals, gorgonians was also high, indicating the importance of these groups in characterising hard bottom habitats.

In 2007, CSIRO conducted extensive benthic habitat mapping surveys and epibenthic fauna (living on the surface and ≥1 cm body size) sampling in deep waters (100–1,000 m) spanning thirteen sites between Barrow Island and Ashmore Reef running along the continental shelf and across the continental slope of the North West Shelf (Williams et al. 2010). At the continental shelf margin (approximately 100 m water depth) Williams et al. (2010) reported that similar benthic habitats occurred at each survey site across the breadth of the North West Shelf. Benthic habitats at this depth comprised a mix of riffled muddy sand (sometimes as a veneer over rocky sub-crops) together with gravel to pebble-sized rubble, cobbles, boulders and some rock outcrops. Typical epifauna found at these depths included scattered isolated hydroids, sea fans and soft corals and often small sponges. Other fauna observed at some of the sites included scattered isolated sea whips, crinoids, sea pens, urchins and anemones. Epibenthic fauna along the continental shelf margin were quantified as sparse and low diversity (Williams et al. 2010). Modelling indicated that a trawl sample of 1 km length would generally be expected to yield approximately 80 individuals represented by 15 species (Williams et al. 2010) in 100 m depth waters.

At the shelf edge (approximately 200 m water depth), two sites were surveyed. Both sites were similar to the continental shelf margin, except the northern site mainly comprised coarse material. Epifauna observed at the northern site was similar at 200 m as at 100 m. At the southern site, epifauna included sparse and scattered individual soft corals, anemones, glass sponges and stalked crinoids (Williams et al. 2010). Modelling indicated epibenthic fauna were sparse and had low diversity, numbering approximately 20–40 individuals in a 1 km long trawl sample represented by approximately 5–10 species (Williams et al. 2010).

Baseline studies undertaken in nearshore areas of the Pilbara (SKM 2009b, Rio Tinto 2009, BHPBIO 2011) and offshore areas around Barrow Island (Chevron 2010) have shown that filter feeder communities are a dominant component of benthic habitats in depths >10 m where reduced light appears to inhibit extensive development of hard corals and macroalgae. The pavement habitats between Barrow Island and the mainland are covered by a sediment veneer that appears to periodically move, exposing areas of pavement reef. Sessile benthic organisms that require hard substrates for attachment, such as gorgonians, are frequently seen emerging through a shallow veneer of sand. This type of substrate (sediment veneer) with sparse filter feeder communities is common throughout this area (SKM 2009b, Rio Tinto 2009, BHPBIO 2011).

3.5. Plankton

Plankton abundance and distribution is patchy, dynamic, and strongly linked to localised and seasonal productivity (Trebilco et al. 2021). Fluctuations in abundance and distribution occur both vertically and horizontally in response to tidal cycles, seasonal variation (light, water temperature and chemistry, currents and nutrients) and cyclonic events. As a key indicator for ecosystem health and change, plankton distribution and abundance has been measured for over a century in Australia (Richardson et al. 2015). The compilation of this data has been made publicly available through the Australian Ocean Data Network (Australian Ocean Data Network 2022) and has been used in the Australia State of the Environment 2021 report (Trebilco et al. 2021) to nationally assess marine ecosystem health. According to their findings, primary production has decreased in the north-west and north-east shelf and offshore in the Indian Ocean.

Within the EMBA, peak primary productivity varies on a local and regional scale. For example, peak phytoplankton biomass in waters surrounding Broome has been observed in May with a high variability recorded in August, whereas recorded phytoplankton biomass in waters surrounding Geographe Bay has been found to peak during winter and is localised close to the coast (Bloundeau-Patissier et al. 2011). In general, these peaks are linked to mass coral spawning events, peaks in zooplankton and fish larvae abundance and periodic upwelling. Regional upwelling is most common close to the coast and where surface waters diverge. Despite the suppression of major upwelling along the WA coast by the Leeuwin Current, known key upwelling regions include the Ningaloo region (Hanson & McKinnon 2009) and Cape Mentelle (Pattiaratchi 2007). It is also expected that a high abundance of plankton will occur within areas of localised upwelling in the EMBA where the seabed disrupts the current flow.

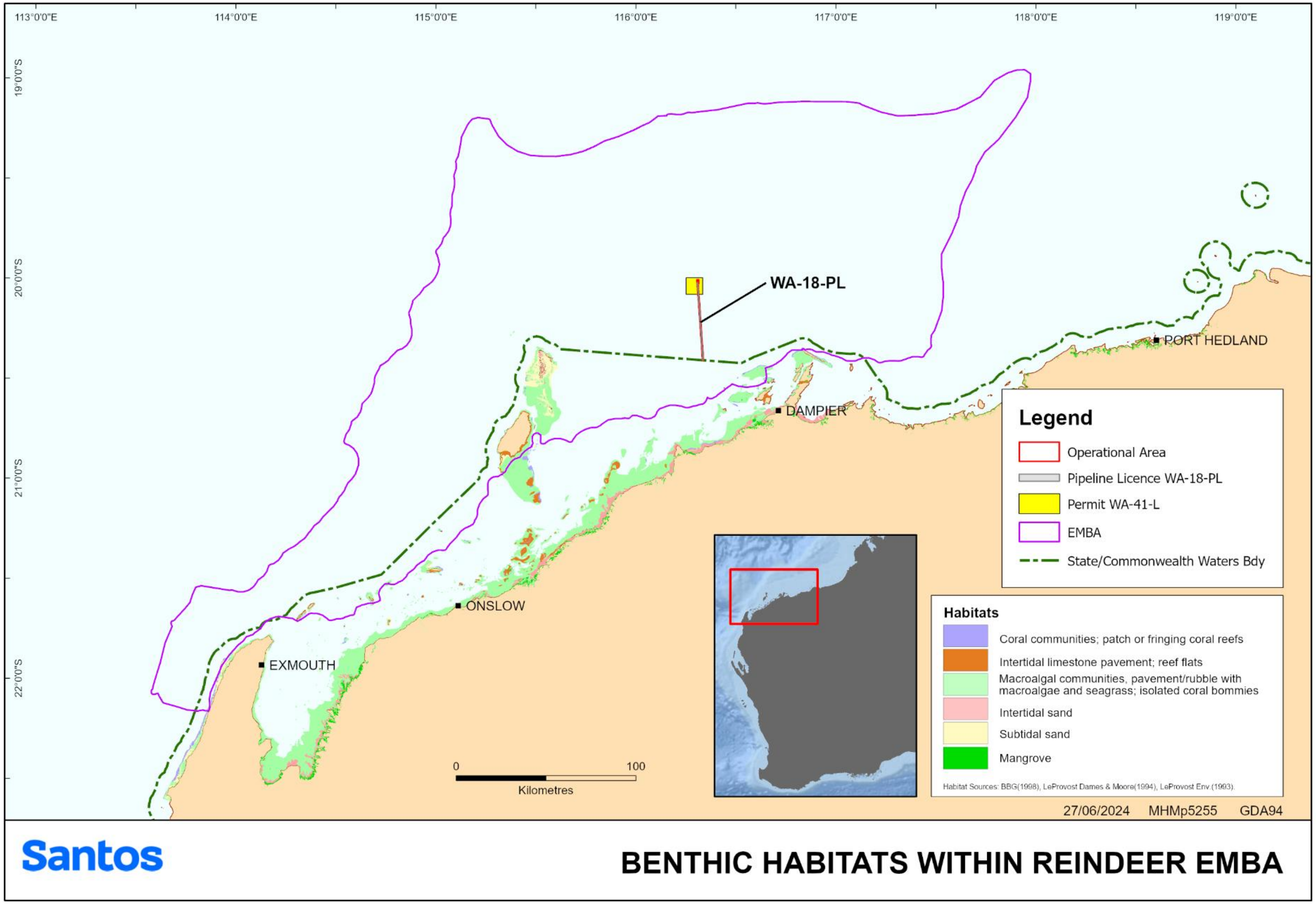


Figure 4: Benthic habitats within Reindeer EMBA

4. Shoreline Habitats

Shoreline habitats are defined as those habitats that are adjacent to the water along the mainland and of islands that occur above the Lowest Astronomical Tide (LAT) and most often in the intertidal zone.

The following section broadly categorises shoreline habitats as the following biological communities; mangroves, intertidal mud/sand banks, beaches, and rocky shores. These communities are discussed in **Sections 4.1- 4.5**, in terms of the 18 IMCRA v. 4.0 bioregions where relevant and where information is available.

Figure 4 broadly illustrate these habitats within the Northwest Shelf Province and Central Western Shelf Transition.

4.1. Mangroves

Mangroves commonly occur in sheltered coastal areas in tropical and sub-tropical latitudes (Kathiresan and Bingham 2001). Up to eight species of mangroves are found further north in the Central Western Shelf Transition region, but at most locations the dominant mangrove (in terms of area of intertidal zone occupied) is *Avicennia marina*, with the stilt rooted mangrove *Rhizophora stylosa* often occurring as thin zones of dense thickets within the broad zone of *A. marina*. Mangroves are found wherever suitable conditions are present including wave dominated settings of deltas, beach/dune coasts, limestone barrier islands and ria/archipelago shores (Semeniuk 1993). Mangrove plants have evolved to adapt to fluctuating salinity, tidal inundation and fine, anaerobic, hydrogen sulfide rich sediment (Duke et al. 1998).

Mangroves are important primary producers and have a number of ecological and economic values. For example, they play a key role in reducing coastal erosion by stabilising sediment with their complex root systems (Kathiresan and Bingham 2001). They are also recognised for their capacity to help protect coastal areas from the damaging effects of erosion during storms and storm surge. Mangroves are also important in the filtration of run-off from the land which helps maintain water clarity for coral reefs which are often found offshore in tropical locations (National Oceanic and Atmospheric Administration (NOAA) 2010). The intricate matrix of fine roots within the soil also binds sediments together.

Mangroves play an important role in connecting the terrestrial and marine environments (Alongi 2009). Numerous studies (e.g. Nagelkerken et al. 2000, Alongi 2002, Alongi 2009, Kathiresan and Bingham 2001) have shown mangroves to be highly productive and an important breeding and nursery areas for juvenile fish and crustaceans, including commercially important species (Kenyon et al. 2004). They also provide habitat for many juvenile reef fish species.

Mangroves also play an important ecosystem role in nutrient cycling and carbon fixing (NOAA 2010). The trees absorb carbon dioxide from the atmosphere and the organic matter such as fallen leaves forms nutrient rich sediments creating a peat layer that stores organic carbon (Alongi 2009, Ayukai 1998).

The muddy sediments that occur in mangrove forests are home to a variety of epibenthic, infaunal and meiofaunal invertebrates (Kathiresan and Bingham 2001). Crustaceans known to inhabit the mud in mangrove systems include fiddler crabs, mud crabs, shrimps and barnacles. Within the water channels of the estuary, various finfish are found from the smaller fish such as gobies and mudskippers (which are restricted to life in the mangroves) through to larger fish such as barramundi (*Lates calcarifer*) and the mangrove jack (*Lutjanus argentimaculatus).* Mangroves and their associated invertebrate-rich mudflats are also an important habitat for migratory shorebirds from the northern hemisphere, as well as some avifauna that are restricted to mangroves as their sole habitat (Garnet and Crowley 2000).

The two key State regulatory documents relevant to the protection and management of mangroves in WA are:

- EPA (2001) Guidance Statement for Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline. Guidance Statement No. 1
- EPA (2016) Technical Guidance – Protection of Benthic Communities and Habitats.

4.1.1. Central Western Shelf Transition

The regional mangroves from Exmouth to Broome (within the Central Western Shelf Transition and southern part of the Northwest Shelf Province) represent Australia's only 'tropical-arid' mangroves. The most significant stand of mangroves in the Central Western Shelf Transition is Mangrove Bay on the western side of the Cape Range Peninsula in the Ningaloo Marine Park. This small area of mangrove (37 ha) represents the largest area of mangrove habitat within the Ningaloo Marine Park and is considered extremely important from a biodiversity conservation perspective (CALM 2005).

4.1.2. Northwest Shelf Province

In the Pilbara region, the coast is a complex of deltas, limestone barrier islands and lagoons, with a variable suite of substrates. As a result, mangroves in this region form relatively diverse fringing stands, albeit often stunted in stature but at times quite extensive in area. The mangroves along the Pilbara coastline are the largest single unit of relatively undisturbed tropical arid zone habitats in the world. The area has nine mangrove taxa and a total of 632 km^2 mangroves (MangroveWatch 2014). As with most arid zone mangroves, Pilbara mangroves are characterised by open woodlands and shrublands that are of relatively lower productivity than the mangrove communities of the wet tropics because of the extreme water and salinity stresses that affect the intertidal zone in the Pilbara (EPA 2001). *Rhizophora stylosa* and *Avicennia marina* are the most common mangrove species along the WA Coast. Significant stands of mangroves in the Pilbara include:

- Exmouth Gulf: mangrove assemblages within the Bay of Rest on the western shore of the Gulf and the extensive mangrove system on the eastern shore of the Gulf that extends as a series of tidal flats and creek channels from Giralia Bay to Yanrey Flats (Astron 2014). These areas of mangrove are also designated as ‘regionally significant’ by the EPA (2001). The importance of these mangroves to the Exmouth Prawn Fishery is discussed in Kangas et al. (2006)
- Mainland coast and nearshore islands: mangrove assemblages at Ashburton River Delta, Coolgra Point, Robe River Delta, Yardie Landing, Yammadery Island and the Mangrove Islands are all designated as ‘regionally significant’ by the WA EPA (2001) and the EPA will give these mangrove formations the highest degree of protection with respect to geographical distribution, biodiversity, productivity and ecological function
- Montebello, Barrow and Lowendal Islands: mangrove assemblages all lay within designated reserves. The mangrove communities of the Montebello Islands are considered globally unique as they occur in lagoons of offshore islands (DEC 2007). Mangrove stands identified on Varanus Island occur on the west coast in discrete patches within the tidal and supratidal zones, at South Mangrove Beach and a small embayment (Astron 2016). Mangrove stands on Varanus Island have been identified as healthy, with similar stands also identified as present on Bridled Island to the north of Varanus Island (Astron 2016).

4.2. Intertidal Mud/Sand Flats

Intertidal mudflats form when fine sediment carried by rivers and the ocean is deposited in a low energy environment. Tidal mudflats are highly productive components of shelf ecosystems responsible for recycling organic matter and nutrients through microbial activity. This microbial activity helps stabilise organic fluxes by reducing seasonal variation in primary productivity which ensures a more constant food supply (Robertson 1988). Intertidal sand and mudflats support a wide range of benthic infauna and epifauna which graze on microscopic algae and microbenthos, such as bivalves, molluscs, polycheate worms and crustaceans (Zell 2007).

The high abundance of invertebrates found in intertidal sand and mudflats provides an important food source for finfish and shellfish which swim over the area at high tide. Mudflats have also been shown to be significant nursery areas for flatfish. During low tide, these intertidal areas are also important foraging areas for indigenous and migratory shorebirds. Mudflats also play a vital role in protecting shorelines from erosion (Wade and Hickey 2008).

4.2.1. Northwest Shelf Province

Within Northwest Shelf Province both Roebuck Bay and Eighty Mile Beach are areas with significant intertidal mudflats that are used by birds in spring and summer including species listed as threatened under the *Biodiversity Conservation Act 2016* (BC Act) or EPBC Act or listed on the IUCN Red List of Threatened Species (IUCN 2019). Intertidal mudflats are also an important feature of the Kimberley coast forming in many bays and inlets of the region (Waples 2007). The sediments that dominate these flats are generally of terrigenous origin (Wilson 2013).

Threatened and migratory birds that occur within the EMBA and are listed under the East Asian-Australasian Flyway are indicated in **Table 10, Table 11**, **Table 12 and Table 14**.

4.3. Intertidal Platforms

Intertidal platforms are areas of hard bedrock and/or limestone with or without a sediment veneer of varying thickness. These platforms can vary from low to high relief and provide a habitat for a diverse range of intertidal organisms (Morton and Britton in Jones 2004, SKM 2009, 2011, Hanley and Morrison 2012) and some species of shore birds (Garnet and Crowley 2000). They are common within each of the coastal bioregions within the EMBA.

4.3.1. Central Western Transition

Limestone pavements extend out from the beach into subtidal zones, e.g. along the Ningaloo Coast and North West Cape; and higher relief platforms (>0.5 m off high water mark) are also present at several headlands along the North West Cape.

4.3.2. Northwest Shelf Province

Large tidal regimes are likely to be the defining environmental factor influencing the distribution of intertidal flora and fauna in the Northwest Shelf Province. The intertidal area of the Kimberley has an extreme tidal range (hypertidal) which creates unique environmental conditions and habitats not seen else anywhere else in the world. As a remote area many of the habitats are untouched and they are recognised as having significant conservation value (DPaW 2013). DPaW (2013) reports that as a result of the monsoonal influxes of freshwater and land-derived nutrients distinctive tropical marine ecosystems have occurred.

4.4. Sandy Beaches

Sandy beaches are those areas within the intertidal zone where unconsolidated sediment has been deposited (and eroded) by wave and tidal action. Sandy beaches can vary from low to high energy zones; the energy experienced influences the beach profile due to varying rates of erosion and accretion. Sandy beaches are found across the EMBA and vary in length, width, and gradient. They are interspersed among areas of hard substrate (e.g. sandstone) that form intertidal platforms and rocky outcrops. There is a wide range of variation in sediment type, composition, and grain size along the EMBA.

Sandy beaches provide habitat to a variety of burrowing invertebrates and subsequently provide foraging grounds for shorebirds (Garnet and Crowley 2000). The number of species and densities of benthic macroinvertebrates that occur in the sand are typically inversely correlated with sediment grain-size and exposure to wave action, and positively correlated with sedimentary organic content and the amount of detached and attached macrophytes (Wildsmith et al. 2005). However, the distributions of these faunas among habitats will also reflect differences in the suite of environmental variables that characterize those habitats (Wildsmith et al. 2005).

Sandy habitats are important for both resident and migratory seabirds and shorebirds (refer **Section 8**). While sand flats and beaches generally support fewer species and numbers of birds than mudflats of similar size; some species such as the beach thick knee (*Esacus giganteus*) a crab eater, are commonly associated with sandy beaches (Garnet and Crowley 2000). Sandy beaches can also provide an important habitat for turtle nesting and breeding (see marine turtles **Section 6.1**).

4.5. Rocky Shorelines

Rocky shorelines are found across the EMBA and are often indicative of high energy areas (wave action) where sand deposition is limited or restricted (perhaps seasonally or during a cyclone). They are formed from limestone pavement extending out from the beach into subtidal zones, for example along the Ningaloo Coast and North West Cape; higher relief platforms (>0.5 m off high water mark) are also present at a number of headlands along the North West Cape.

Rocky shores can include pebble/ cobble, boulders, and rocky limestone cliffs (often at the landward edge of reef platforms). Rocky outcrops typically consist of hard bedrock, but some of the coastline has characteristic limestone karst cliffs with an undercut notch. Rocky shorelines can vary from habitats where there is bedrock protruding from soft sediments to cliff like structures that form headlands. Rocky shorelines are an important foraging area for seabirds and habitat for invertebrates found in the intertidal splash zone (Morton and Britton cited in Jones 2004). For example, oyster catchers and ruddy turnstones feed along beaches and rocky shorelines.

5. Fishes and Sharks

Fish distributions in the EMBA are discussed with respect to the IMCRA Provincial Bioregions which were defined using CSIRO's 1996 regionalisation of demersal fish on the continental shelf to the shelf break, and their 2005 regionalisation of demersal fish on the continental slope to approximately 1,200 m depth (DEH 2006). The EPBC species listed as threatened and migratory found in the EMBA, according to the Protected Matters search (), are shown in **Table 1,** along with their WA conservation listings (as applicable) and discussed in **Section 5.2** below.

The following WA conservation codes apply to WA conservation significant fauna:

- Threatened species (listed under the *Biodiversity Conservation Act 2016* (WA) (BC Act)):
  - Critically endangered
  - Endangered
  - Vulnerable
- Specially protected species (listed under BC Act):
  - Migratory
  - Species of special conservation interest (conservation dependant fauna)
  - Other specially protected species
- Priority species (non-statutory state based administrative process):
  - Priority 1, 2 and 3: poorly-known species – possible threatened species that do not meet survey criteria or are otherwise data deficient. Ranked in order of priority. In urgent need of further survey.
  - Priority 4: species that are adequately known, are either: rare but not threatened; meet criteria for near threatened; or delisted as threatened species within last five years for reasons other than taxonomy. Requiring regular monitoring.

A detailed account of commercial and recreational fisheries that operate in the region is provided in the Commercial Fisheries **Section 14.7** and detailed in *The State of the Fisheries Report* 2021/2022 (Newman et al., 2023).

Table 1: EPBC listed fish and shark species in the EMBA

Species	Conservation Status				Likelihood of occurrence in EMBA	BIA[1] in EMBA
	EPBC Act 1999	BC Act 2016[2]	Other WA Conservation Code	TPWC Act 1976		
Cape range cave gudgeon, Blind gudgeon (*Milyeringa veritas)*	Vulnerable	Vulnerable	-	-	Species or species habitat known to occur within area.	None - No BIA defined
Grey nurse shark (*Carcharias taurus*)	Vulnerable	Vulnerable	-	Listed nationally	Congregation or aggregation known to occur within area.	None - BIA not found in EMBA
White shark, Great white shark (*Carcharodon carcharias*)	Vulnerable & Migratory	Vulnerable	-	-	Foraging, feeding or related behaviour known to occur within area.	None - BIA not found in EMBA
Whale shark (*Rhincodon typus*)	Vulnerable & Migratory	Migratory	-	Listed nationally	Foraging, feeding or related behaviour known to occur within area.	Yes – Refer to **Table 3**
Dwarf sawfish, Queensland sawfish *(Pristis clavata*)	Vulnerable & Migratory	Migratory	Priority 1	Vulnerable	Breeding known to occur within area.	None - BIA not found in EMBA
Freshwater sawfish, Largetooth sawfish, River sawfish, Leichhardt's sawfish, Northern sawfish (*Pristis pristis)*	Vulnerable & Migratory	Migratory	Priority 3	Vulnerable	Species or species habitat known to occur within area.	None - BIA not found in EMBA
Narrow sawfish, Knifetooth sawfish (*Anoxypristis cuspidata*)	Migratory	Migratory	-	-	Species or species habitat likely to occur within area.	None - No BIA defined
Green sawfish, Dindagubba, Narrowsnout sawfish (*Pristis zijsron*)	Vulnerable & Migratory	Vulnerable	-	Vulnerable	Breeding known to occur within area.	None - BIA not found in EMBA
Oceanic whitetip shark (*Carcharhinus longimanus*)	Migratory	-	-	-	Species or species habitat likely to occur within area.	None - BIA not found in EMBA
Shortfin mako, Mako shark (*Isurus oxyrinchus*)	Migratory	Migratory	-	-	Species or species habitat likely to occur within area.	None - BIA not found in EMBA
Longfin mako (*Isurus paucus*)	Migratory	Migratory	-	-	Species or species habitat likely to occur within area.	None - No BIA defined
Reef manta ray, Coastal manta ray (*Manta alfredi*)	Migratory	Migratory	-	-	Species or species habitat known to occur within area.	None - No BIA defined
Giant manta ray (*Manta birostris*)	Migratory	Migratory	-	-	Species or species habitat known to occur within area.	None - No BIA defined
Scalloped hammerhead shark (*Sphyrna lewini)*	Conservation Dependent	-	-	Listed nationally	Species or species habitat known to occur within area	None - No BIA defined
Southern bluefin tuna *(Thunnus maccoyii)*	Conservation Dependent	-	-	-	Breeding known to occur within area	None - No BIA defined

[1] Biologically Important Area
[2] The Wildlife Conservation (Specially Protected Fauna) Notice 2018 has been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of threatened, extinct and specially protected species under Part 2 of the BC Act.

5.1. Regional Surveys

Within the EMBA a number of important geographical areas for fish exist, including Ningaloo Marine Park, Montebello/Barrow Island Marine Park.

5.1.1. Central Western Shelf Transition

Ningaloo is the largest fringing coral reef in Australia, forming a discontinuous barrier that encloses a lagoon that provides habitat for many fish species. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). Ningaloo Reef is a well-known biodiversity hotspot, supported by the direct link between the reef and the ancient reef systems found closer to the equator by the Leeuwin Current (Kemps 2010). Approximately 500 species of fish have been reported to inhabit the reef (Kemps 2010). The Piercam project from inception in 2005 to 2013, identified 165 fish species from 50 families at the Point Murat Navy Pier alone, located within the Ningaloo Marine Park (Whisson & Hoschke 2013).

Seasonal aggregations of whale sharks occur at Ningaloo each year (CALM 2005). There is limited data available on species diversity and distribution of sharks in the Ningaloo area as chondrichthyan biodiversity for the area has not been specifically recorded. Despite this, it is possible that the Ningaloo Reef Marine Park contains the largest and most diverse collection of sharks on the Australian coastline (Stevens et al. 2009). It was estimated in 2009 by Last and Stevens (cited in Stevens et al. 2009), that there are likely to be 118 species of chondrichthyan fishes occurring in the park. Of these species, 59 are shark species predicted to be found at depths of less than 200 m (Stevens et al. 2009).

The lagoon at Ningaloo Reef appears to provide a juvenile habitat and nursery area for shark species such as the grey nurse shark (*C. taurus*), black-tipped reef shark (*Carcharhinus melanopterus*) and other reef sharks (Carcharhinidiae) (Stevens et al. 2009). A study conducted on the distribution and abundance of elasmobranches in the Ningaloo Marine Park, in 2009, tracked the movements of six key shark species. Species such as *Galeocerdo cuvier* (tiger shark) and *Sphyrna mokarran* (great hammerhead) were found to remain for brief time periods in the park, in contrast to other species found to re-visit the Ningaloo area (Stevens et al. 2009). Several species of sharks within Ningaloo have been identified as key indicator species for the health of the system (Stevens et al. 2009).

Barrow Island includes Biggada Reef, an ecologically significant fringing reef, and the Montebello Islands comprise over 100 islands, the majority of which are rocky outcrops; providing fish habitat (DEC 2007a). Within the Barrow/Montebello region, at least 380 fish species have been recorded (de Lestang & Jankowski 2017). Most species exhibit wide distributions, with local species composition closely resembling that of the Dampier Archipelgao. Coral habitats support the most diverse fish community in this region, comprising, among others, many species of damselfish (Pomacentridae), parrotfish (Scaridae), snappers (Lutijanidae) and groupers (Serranidae) (de Lestang & Jankowski 2017). The region's macroalgal habitats are considered important nursery areas for a diverse range of fish species, such as emperor (Lethrinidae), threadfin bream (Nemipteridae), tuskfish (Labridae) and trevally (Carangidae) (de Lestang & Jankowski 2017).

Ramsar wetlands within the area (e.g. Eighty Mile Beach and Ashmore Reef National Nature Reserve) can also provide important habitat for fish (see **Section9.2**).

5.1.2. Central Western Transition

The biological communities of the Central Western Transition are thought to be distinctive owing to the proximity of deep oceans areas to the continental slope and shelf, resulting in close interaction between pelagic species of the Cuvier Abyssal Plain and those of the slope and shelf (DEWHA 2008a).

The present level of understanding of the marine environment in this bioregion is generally poor. The diversity of fish and cephalopod species changes with depth, generally decreasing species numbers with increasing depth. The demersal slope fish bioregionalisation identified some endemism in communities in this bioregion (Last et al. 2005), however, it is lower than other areas of the North-west Marine Region (DEWHA 2008a).

Bentho-pelagic fish, such as deep-water snappers (e.g. *Paracaesio* spp, and *Eletis* spp.), hatchetfish (*Argyropelecus* spp.), dragonfish (*Melacosteus* spp.), viperfish (*Chauliodus* spp.) and a number of eels species migrate between the benthic and pelagic systems, forming an important link between these systems (DEWHA 2008a).

Transient fish species through the Central Western Transition bioregion include southern bluefin tuna (migrating to and from spawning grounds), broadbill swordfish (*Xiphius gladius*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*) and striped marlin (*Tetrapturus audax*). Pelagic sharks also range across the bioregion following schools of pelagic fish (DEWHA 2008a).

5.1.3. Northwest Transition

The Northwest Transition bioregion may support sparse populations of bentho-pelagic fish and cephalopods in low densities. Pelagic fish species likely to be present include grenadiers and hatchetfish (*Argyropelecus* spp.) as well as transient populations of highly mobile pelagic fish. Adult and juvenile southern bluefin tuna are through to migrate through this bioregion on their way to and from spawning grounds in the north-eastern Indian Ocean (DEWHA 2008a).

The slope habitat of this bioregion is associated with important populations of demersal fish species and supports the second richest demersal fish assemblage nationally (Last et al. 2005). Over 508 fish species have been identified on the slope in this area and 64 of these species are endemic. The high diversity and endemism of the demersal fish fauna indicates important interactions between physical processes and trophic structures in this bioregion. For more information on the slope habitat for fish and sharks, refer to **Section 10.1.5**.

The Rowley Shoals within the Northwest Transition comprise three oceanic reef systems approximately 30–40 km apart, namely Mermaid Reef, Clerke Reef and Imperieuse Reef. The Shoals are thought to provide a source of invertebrate and fish recruits for reefs further south and as such are regionally significant (DEC 2007b).

5.1.4. Northwest Shelf Province and Northwest Province

The demersal zone of the North West Shelf (which includes the Northwest Province and Northwest Shelf Province) hosts a diverse assemblage of fish of tropical Indo-west Pacific affinity, with up to 1,400 species known to occur, with a great proportion of these occurring in shallow coastal waters (Allen et al. 1988). Last et al. (2005) and Fox and Beckley (2005) described the North-west Province as being characterised by a high level of endemism and species diversity. Certain areas of increased biological activity (e.g. Glomar Shoals) attract demersal fish species such as Rankin cod, red emperor, crimson snapper and spangled emperor that are exploited by commercial trawl and trap fisheries (Sainsbury et al. 1992, Fletcher and Santoro 2013).

The shallow waters (<30 m) of the Dampier Archipelago, in the Northwest Shelf Province, support a characteristic and rich fish fauna of 650 species from a variety of habitats including coral and rocky reefs, mangroves, sand and silty bottoms and sponge gardens (Hutchins 2003 & 2004). The majority of these species are found over hard substrate, but significant numbers are also found from soft bottom and mangrove areas. The outer islands of the Archipelago are inhabited predominantly by coral reef fishes whereas inner areas close to the mainland are occupied by mangrove and silty-bottom dwellers. The inter-island passages have a relatively rich soft bottom fauna. EPBC Act protected fish species within the Dampier Archipelago include the dwarf sawfish (*Pristis clavata*), freshwater sawfish (*Pristis pristis*) and narrow sawfish (*Anoxypristis cuspidate*).

The fish fauna of the archipelago is less diverse than the islands of the West Pilbara to the south but are closely related to the fauna at the offshore Montebello Islands (Hutchins 2004). The fish fauna of Barrow/ Lowendal/ Montebello Islands are widespread throughout the Indo-west Pacific region.

Within the southern portion of the Northwest and Northwest Shelf Province, small pelagic fish (e.g. lantern fishes) comprise a third of the total fish biomass (Bulman 2006) and inhabit a range of marine environments, including inshore and continental shelf waters. These small pelagic fish play an important ecological role, not only for this particular area but for the entire NWMR. They feed on pelagic phytoplankton and zooplankton and provide a food source for a wide variety of predators such as marine mammals, sharks, large pelagic fish and seabirds, thus providing a vital link between many of the region's trophic systems (Mackie et al. 2007).

Pelagic fish in the Northwest and Northwest Shelf Province include tuna, mackerel, herring, pilchard and sardine, and game fish such as marlin and sailfish (BBG 1994, Brewer et al. 2007), some of which are targeted by both commercial and recreational fishers. In particular, adult and juvenile southern bluefin tuna are thought to migrate through the North West Shelf on their way to and from spawning grounds in the north-eastern Indian Ocean. However, the timing of these migrations and the use of regional currents to assist their migration is still unclear. The oceanic waters of the North West Shelf are also believed to provide important spawning and nursery grounds for a number of large pelagic fish species. **Table 2** provides a summary of the key fish species and likely timing of their spawning in the region (DoF correspondence).

Table 2: Spawning and aggregation times of key commercially caught fish species within the North West Shelf

Species		Month											
Species Common Name	**Species Latin Name**	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Blacktip shark	*Carcharhinus tilstoni* and *C. limbatus*												
Goldband snapper	*Pristipomoides multidens*												
Rankin cod	*Epinephelus multinotatus*												
Red emperor	*Lutjanus sebae*												
Sandbar shark	*Carcharhinus plumbeus*												
Spanish mackerel	*Scomberomorus commerson*												
Pink snapper	*Pagrus auratus*												
Baldchin groper	*Choerodon rubescens*												
Crystal (snow) crab	*Chaceon* spp.												
King George whiting	*Sillaginodes punctatus*												
Spangled emperor	*Lethrinus nebulosus*												
Pearl oyster	*Pinctada maxima*												
Blue-spotted emperor	*Charaxes cithaeron*												
Dusky whaler	*Carcharhinus obscurus*	May occur throughout the year											
Whiskery shark	*Furgaleus macki*												
Gummy shark	*Mustelus antarcticus*	Peak pupping periods unknown											
Fish	Other species	Timing of spawning activity varies between species											

5.2. Fish Species

Two species of fish listed as Threatened under the EPBC Act (**Table 1**) were identified in the Protected Matters search (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023):

- Blind gudgeon (*Milyeringa veritas*)
- Southern bluefin tuna *(Thunnus maccoyii)*

In addition, the Barrow cave gudgeon *(Milyeringa justitia*) has been identified as relevant threatened species under the BC Act. This species is not listed under the EPBC Act.

5.2.1. Blind Gudgeon

Both the blind gudgeon (*Milyeringa veritas*) and blind cave eel (*Ophisternon candidum*) are known to occur on the Cape Range Peninsula (in the Central Western Shelf Transition) (Humphreys and Feinberg 1995), and a related species of the genus Milyeringa, the Barrow cave gudgeon *(Milyeringa justitia*) has also been noted at Barrow Island (Humphreys 1999). The Barrow cave gudgeon is listed as Vulnerable under the WA BC Act. They have been recorded in waters ranging from fresh to seawater at depths of up to 33 m in caves and 50 m in wells and bores. Both species are restricted to either caves or groundwater (Humphreys and Blyth 1994) and are the only two vertebrate animals known from Australia for this (DoE 2014a).

5.2.2. Southern Bluefin Tuna

The southern bluefin tuna (SBT; *Thunnus maccoyii)* is listed as conservation dependent under the EPBC Act and may be found within the EMBA (DCCEEW, 2024c). In Australia, SBT are distributed throughout temperate and tropical waters, primarily from northern WA through southern Australia, with a spawning ground identified between Java and northern WA. As the species is long-lived and slow to mature, it is vulnerable to overfishing and stocks have undergone a significant decline. As SBT are pelagic and highly migratory, and are commercially targeted internationally, a cooperative management approach was necessary to manage the fishery. Established in 1995, the Commission for the Conservation of Southern Bluefin Tuna utilises an international approach to manage the status of the species, through national allocations of total allowable catch and prescribing additional management measures as required (DCCEEW, 2024c).

No southern bluefin tuna BIAs were identified in the EMBA.

5.2.3. Syngnathids

The EPBC Protected Matters search also identified 35 listed marine species of fish which are largely from the family Syngnathidae (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023). Syngnathids are a group of bony fishes that include seahorses, pipefishes, pipehorses and sea dragons, although taxonomic uncertainty still surrounds a number of these (DEWHA 2012a). Knowledge about the distribution, abundance and ecology of syngnathids is limited, although no species is currently listed as threatened or migratory.

5.2.4. Octopuses

A diversity of octopus species are found within the waters surrounding Australia, where they inhabit a range of habitats from the intertidal zone, along the continental shelf, to the water column in the open ocean (Norman and Reid 2000).Several species are targeted by commercial (**Section 14.7.1**) and recreational fishers.

5.3. Sharks, Rays and Sawfishes

The diversity of marine environments in the waters within the NWMR has led to a rich fauna of cartilaginous fish (sharks and rays). Of the approximately 500 shark species found worldwide, 19% (94) are found in the region (DEWHA 2008a). The EPBC Act Protected Matters search (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023) identified four species of shark and three species of sawfishes listed as threatened within the EMBA (**Table 1**), including:

- Grey nurse shark (*Carcharias taurus*)
- Great white shark (*Carcharodon carcharias*)
- Whale shark (*Rhincodon typus*)
- Scalloped hammerhead shark (*Sphyrna lewini)*
- Dwarf sawfish (*Pristis clavata*)
- Freshwater sawfish (*Pristis pristis*)
- Green sawfish (*Pristis zijsron*).

An additional 5 sharks and rays are specially protected as migratory under the BC Act 2016 in the EMBA.

Stingrays are found in Australia's coastal waters throughout the EMBA, primarily occupying shallow benthic habitats. Some nearshore and intertidal habitats, particularly in regions of northern Australia that experience greater tidal ranges have been identified as important nursery areas for many of these species (DBCA 2014).

The Biologically Important Areas (BIAs) for relevant species detailed above are illustrated in **Figure 5**.

5.3.1. Grey Nurse Shark

The grey nurse shark (*Carcharias taurus*) is listed as vulnerable under the EPBC Act and the BC Act *and* may be found within the EMBA. In Australia, the grey nurse shark is now restricted to two populations, one on the east coast from southern Queensland to southern NSW and the other is predominantly found around the southwest coast of WA but has been recorded on the North West Shelf (DEWHA 2012b, Pogonoski et al. 2002). It is believed that the east and west coast populations do not interact, and ongoing research will probably confirm that the populations are genetically different (Last and Stevens 2009).

While it is thought that grey nurse sharks have a high degree of site fidelity, some studies (McAuley 2004) suggest that grey nurse sharks move between different habitats and localities, exhibiting some migratory characteristics. In certain areas grey nurse sharks are vulnerable to localised pressure due to high endemism. The status of the west coast population is poorly understood although they are reported to remain widely distributed along the WA coast and are still regularly encountered, albeit with low and indeterminate frequency (Chidlow et al. 2006).

Grey nurse sharks are often observed hovering motionless just above the seabed, in or near deep sandy-bottomed gutters or rocky caves, and in the vicinity of inshore rocky reefs and islands (Pollard et al. 1996). The species has been recorded at varying depths but is generally found between 15–40 m (Otway & Parker 2000). Grey nurse sharks have also been recorded in the surf zone, around coral reefs, and to depths of around 200 m on the continental shelf (Pollard et al. 1996). Grey nurse sharks feed primarily on a variety of teleost and elasmobranch fishes and some cephalopods (Gelsleichter et al. 1999, Smale 2005).

No grey nurse shark BIAs were identified in the EMBA.

5.3.2. Great White Shark

The great white shark (*Carcharodon carcharias*) is listed as vulnerable and migratory under the EPBC Act and is listed as vulnerable under the BC Act. In Australia, great white sharks have been recorded from central Queensland around the south coast to northwest WA but may occur further north on both coasts (Last and Stevens 2009). There are no known aggregation sites for white sharks in the North-west marine region, but the species has been recorded in North West Shelf waters during humpback migrations (DEWHA 2012b). They are widely but not evenly distributed in Australian waters and are considered uncommon to rare compared to most other large sharks (CITES 2004).

Study into great white shark populations is difficult (Cailliet 1996) given the uncertainty about their movements, emigration, immigration and difficulty in estimating the rates of natural or fishing mortality.

Great white sharks can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas (Pogonoski et al. 2002). They also make open ocean excursions and can cross ocean basins (for instance from South Africa to the western coast of Australia and from the eastern coast of Australia to New Zealand). Great white sharks are often found in regions with high prey density, such as pinniped colonies (DEWHA 2009).

5.3.3. Whale Shark

The whale shark (*Rhincodon typus*) is listed as vulnerable and migratory under the EPBC Act and is also listed as a specially protected species under the BC Act as a species of special conservation interest (conservation dependent fauna). The species is also classified as vulnerable on the World Conservation Union's Red List of Threatened Species (Norman 2005) and are protected under the WA *Conservation and Land Management Act 1984,* NT TPWC Actand WA *Fish Resources Management Act 1994*.

The whale shark is the largest of all fish (>18 m; Borrell et al. 2011; Chen et al. 1997, Compagno 2001) and is a migratory species with worldwide geographical ranges between 30º N and 35º S (Last and Stevens 2009). Whale sharks are mostly epipelagic, whereby they spend a large amount of time in the top 200 m of the ocean (Tyminski et al. 2015), with a significant portion being spent at surface (<20 m) (Rowat & Brooks, 2012). This leads to an increased potential risk of vessel collision, which has been demonstrated from tracking data of 348 individuals (across all areas of distribution) showing a 92% horizontal and nearly 50% vertical space overlap with persistent large vessel (>300 gross tons) traffic (Womersley et al. 2022). There is a general lack of knowledge on many aspects of whale shark biology, however, the species is known to have a slow rate to sexual maturity, with field-based studies from the Maldives estimating male sexual maturity to be approximately 25 years (Perry et al. 2018), with females potentially maturing even later (Pierce et al. 2021). This 'slow' life-history strategy places whale sharks at increased vulnerability to anthropogenic impacts (Pierce et al. 2021).

The species is oceanic but often forms aggregations in coastal waters at sites throughout the tropics. Typically, these aggregations are seasonal and often coincide with specific productivity events that are a focus of feeding for the animals. For example, whale sharks aggregate to feed on dense swarms of copepods in Baja California (Clark and Nelson 1997), fish spawn off Belize (Heyman et al. 2001) and red crab larvae at Christmas Island (Meekan et al. 2009). However, recent studies analysing fatty acids within whale shark tissue, suggest the species may also feed on benthic food sources, such as floating macroalgae (Meekan et al*.*, 2022; Courturier et al*.*, 2013*;* Marcus et al., 2016).

One of the best-known aggregation sites for whale sharks occurs along the central and NW coast of Western Australia from March to July and is focused on Ningaloo Reef, within the Exmouth region. The small size and general absence of female whale sharks from Ningaloo Reef suggests that the region may be important for feeding rather than breeding (Norman and Stevens 2007). The timing of this aggregation coincides with a pulse in seasonal productivity that results in large abundances of tropical krill on which these filter feeding sharks feed (Meekan et al. 2006, Jarman and Wilson 2004). At Ningaloo Reef, whale sharks are often found swimming close to the reef front, within a few kilometres of the shore and in water of less than 50 m deep. A tourist industry based on snorkelling with the sharks in this area has developed over the last 15 years and is now estimated to be worth over $4 million annually to the local economy of the Ningaloo region.

Estimates of the size of the population participating in the Ningaloo aggregation are between 300 and 500 individuals (Meekan et al. 2006), but research indicates that the Ningaloo population of whale sharks is declining (Bradshaw et al. 2007).

Whale sharks are known to be highly migratory with migrations of 13,000 km being recorded (Eckert and Stewart 2001). Research on the migration patterns of whale sharks in the western Indian Ocean, and isolated and infrequent observations of individuals, indicate that a small number of the Western Australian population migrate through the North West Shelf. Wilson et al. (2006) tagged 19 whale sharks in 2003 and 2004, with long term movements patterns successfully recorded from six individuals. All travelled north-east into the Indian Ocean after departing Ningaloo Reef, with one tracked to Ashmore Reef and another to Scott Reef. Whale sharks are occasionally observed from Santos'' offshore oil and gas facilities on the North West Shelf (Harriet Alpha and Stag platforms). In general, migration along the northern WA coastline broadly follows the 200 m isobath and typically occurs between July and November (DoE 2015).

A common method for monitoring individual whale sharks is the use of variations in spot patterns, which has recently been tested to be 100% successful based on 154 photographic and genetic markers (Meenakshisundaram, 2021).

A biologically important area for whale sharks is located in northern WA, offshore of the Pilbara and Kimberley coastline, and broadly follows the 200 m isobath. The relevant whale shark BIAs in the EMBA are detailed in **Table 3**.

DBCA has a wildlife management program to manage whale shark interactions in reserves - Whale shark management with particular reference to Ningaloo Marine Park, Wildlife Management Program no. 57 (2013).

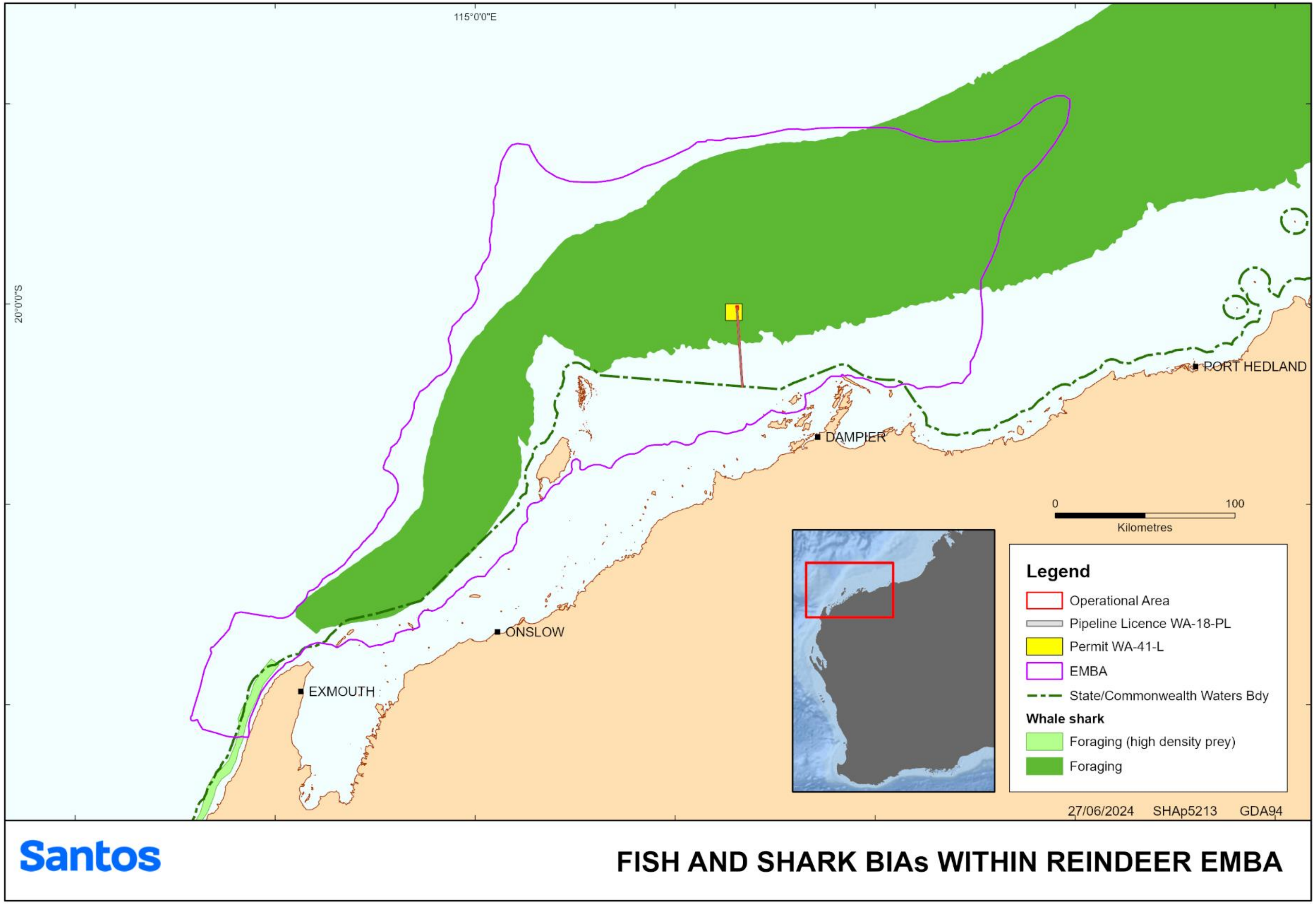


Figure 5: Biologically Important Areas – Fish and Sharks

5.3.4. Dwarf Sawfish

The dwarf sawfish (*Pristis clavata*) is listed as vulnerable under the EPBC Act and thought to be restricted to Australia (DoE 2014b). It is also listed as a Priority 1 conservation species in WA and as Vulnerable in the NT. The Australian distribution of the dwarf sawfish is considered to extend across northern Australia and along the Kimberley and Pilbara coasts (Last and Stevens 2009, Stevens et al. 2005). However, the majority of records of dwarf sawfish in WA and the NT have come from shallow estuarine waters of the Kimberley region which are believed to be nursery (pupping) areas, with immature juveniles remaining in these areas up until three years of age (Thorburn et al. 2004). Adults are known to seasonally migrate back into inshore waters (Peverell 2007); although it is unclear how far offshore the adults travel as captures in offshore surveys are very uncommon. The species' range is restricted to brackish and salt water (Thorburn et al. 2007).

The recovery plan identifies pupping as known to occur in the King Sound, the Cambridge Gulf and 80 Mile Beach, with pupping likely to occur identified at a number of locations along the Pilbara and Kimberly Plan (Commonwealth of Australia, 2015). Under the associated recovery plan all areas where aggregations of individuals have been recorded displaying biologically important behaviours such as breeding, foraging, resting or migrating are considered critical to the survival of the species unless population data suggests otherwise.

5.3.5. Freshwater and Green Sawfish

The freshwater sawfish (*Pristis pristis) (*also previously listed as the Largetooth sawfish*)* and green sawfish (*Pristis zijsron)* are listed as vulnerable under the EPBC Act. The freshwater sawfish is listed as a Priority 3 conservation species in WA, while the green sawfish is listed as Vulnerable under the BC Act and both species are listed as Vulnerable in the NT under the TPWC Act*.*

The freshwater species are wider-ranging than the dwarf sawfish and are also found in the Indo-west Pacific (DoE 2014c, DoE 2014d). Important areas for sawfishes include King Sound, and the Fitzroy, Durack, Robinson and Ord rivers for the freshwater sawfish; and Cape Keraudren for the green sawfish (Stevens et al. 2008, Thorburn et al. 2007, 2008).

Sawfishes generally inhabit inshore coastal, estuarine and riverine environments. The freshwater sawfish has been recorded in north-west Australia from rivers (including isolated water holes), estuaries and marine environments (Stevens et al. 2005). Newborns and juveniles primarily occur in the freshwater reaches of rivers and in estuaries, while most adult freshwater sawfish have been recorded in marine and estuarine environments (Peverell 2005, Thorburn et al. 2007). It is believed that mature freshwater sawfish enter less saline waters during the wet season to give birth (Peverell 2005) and freshwater river reaches play an important role as nursery areas (DoE 2014c).

The green sawfish has predominantly been recorded in inshore coastal areas, including estuaries and river mouths with a soft substrate, although there have been records of sawfish offshore in depths up to 70 m (Stevens et al. 2005). This species does not occupy freshwater habitats (DoE 2014d).

Short-term tracking has shown that green sawfish appear to have limited movements that are tidally influenced, and they are likely to occupy a restricted range of only a few square kilometres within the coastal fringe, with a strong association with mangroves and adjacent mudflats (Stevens et al. 2008). Sawfishes feed close to the benthos on a variety of teleost fishes and benthic invertebrates, including cephalopods, crustaceans and molluscs (Compagno & Last 1999, Last & Stevens 2009, Pogonoski et al. 2002, Thorburn et al. 2007, 2008).

Baseline surveys undertaken for Chevron’s Wheatstone project identified green sawfish habitat and nursery area for juveniles within the north-eastern lagoon of the Ashburton Delta and in Hooley Creek near Onslow. Distribution of sawfish in these creeks is spatially and seasonally variable due to changing tidal and environmental conditions. However, they typically return to inshore waters to breed and pup during the wet season (i.e. January) (Chevron 2011).

5.3.6. Scalloped Hammerhead Shark

The scalloped hammerhead shark (*Sphyrna lewini*) is listed as conservation dependent under the EPBC Act and may be found within the EMBA. Globally distributed, in Australia, scalloped hammerhead sharks are found in both coastal and oceanic environments, in warm-temperate to tropical waters typically across the northern coastline. There are no aggregation sites identified for scalloped hammerhead sharks in the EMBA, however juveniles of the species utilise shallower nearshore habitats of northern Australia, and there are some indications that there may be important nursery habitats in the area. As a species that is slow to mature and has low fecundity, the scalloped hammerhead shark is vulnerable to overfishing, with its unique head morphology also increasing its likelihood of capture as bycatch in net fisheries. Although no longer targeted by commercial fisheries, global population declines have prompted recent changes to national and state-based approaches to stock management, including total allowable catch limits (Northern Territory) or complete prohibition of take (Queensland) (DCCEEW, 2024d).

No scalloped hammerhead shark BIAs were identified in the EMBA.

5.3.7. Narrow Sawfish

The narrow sawfish (*Anoxypristis cuspidata*) is listed as migratory under the EPBC Act. It is a marine or marginal (brackish water) species found from inshore waters to a depth of 40 m (Compagno et al. 2006). Though details of its ecology are not precisely known, it probably spends most of its time on or near the bottom in shallow coastal waters and estuaries. A study showed the narrow sawfish to be the most abundant amongst the sawfish sampled in the Gulf of Carpentaria (Peverell, 2005) which holds some consistency with the offshore distribution of the species as shown by a study of Northern Prawn Fishery by-catch. Peverell (2005) also used catch data of offshore surface net fisheries to conclude that narrow sawfish also inhabit the mid-water column and can thus be described as a benthopelagic animal. The narrow sawfish is known to form aggregations of mature females during the months of October to November. Its Australian distribution is unclear though it is most common in the Gulf of Carpentaria with southward ranges extending to Broad Sound in Queensland and the Pilbara Coast (circa 116°E), Western Australia (Last & Stevens 2009).

5.3.8. Giant Manta Ray / Reef Manta Ray

The giant manta ray appears to be a seasonal visitor to coastal or offshore sites. Giant manta rays are often seen aggregating in large numbers to feed, mate, or clean. Sightings of these giant rays are often seasonal or sporadic but in a few locations their presence is a more common occurrence. This species is not regularly encountered in large numbers and, unlike some other rays do not often appear in large schools (>30 individuals) when feeding. Overall, they are encountered with far less frequency than the smaller manta species, despite having a larger distribution across the globe (IUCN 2019).

The giant manta ray (*Mobula birostris*) occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. They are commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. The giant manta ray is commonly encountered on shallow reefs while being cleaned or is sighted feeding at the surface inshore and offshore. It is also occasionally observed in sandy bottom areas and seagrass beds (IUCN 2019).

The reef manta ray (*Mobula birostris*) has a circumtropical and sub-tropical distribution, existing in the Pacific, Atlantic and Indian Oceans. Within this broad range, however, actual populations appear to be sparsely distributed and highly fragmented. This is likely due to the specific resource and habitat needs of this species.

Overall population size is unknown, but subpopulations appear, in most cases, to be small (about 100–2,000 individuals). A proportion of the individuals in some populations undertake significant coastal migrations (IUCN 2019). Since the species is migratory it is possible that individuals may be encountered in the operational area, however, given that they generally do not aggregate in large groups, high numbers are not expected to be encountered during the activities.

5.3.9. Oceanic Whitetip Shark

The oceanic whitetip shark (*Carcharhinus longimanus*) is listed as migratory under the EPBC Act. The oceanic whitetip shark is widespread throughout tropical and subtropical waters of the world (30° N to 35° S) (IUCN 2020). They are an oceanic and pelagic species that regularly occurs in waters of 18 to 28°C, usually >20°C (IUCN 2020). Within Australian waters, they are found from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney (Last and Stevens 2009). They are usually found in surface waters, though can reach depths of >180 m (Castro et al. 1999). They have occasionally been recorded inshore but are more typically found offshore or around oceanic islands and areas with narrow continental shelves (Fourmanoir 1961, Last and Stevens 1994).

5.3.10. Shortfin Mako and Longfin Mako Sharks

The shortfin mako and longfin mako sharks are listed as migratory under the EPBC Act. The longfin mako is widely distributed but rarely encountered oceanic shark that ranges from Geraldton around the north coast to at least Port Stephens in New South Wales (DSEWPaC 2012). The shortfin mako is an oceanic and pelagic species, although they are occasionally seen inshore. They are found throughout temperate seas but are rarely found in waters colder than 16°C.

5.4. Biologically Important Areas / Critical Habitat – Fishes and Sharks

BIAs are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration. BIAs are identified by DCCEEW; however, they have no legal status, but are designed to assist decision making under the EPBC Act. They are not designed to identify protected areas but may inform such processes. **Table 3** below provides an overview of BIAs in the EMBA for fish.

The DCCEEW may make recovery plans for threatened fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, and summary of relevant recovery plans is listed in **Section 13.2**. BIAs may overlap these sites but may be identified for other purposes. DCCEEW state that the criteria used to identify 'habitat critical to the survival of the species' are more complex than those used to identify BIA. Specifically, the Sawfish and River Sharks Multispecies Recovery Plan (DoEE 2015) cites that *"all areas where aggregations of individuals have been recorded displaying biologically important behaviour such as breeding, foraging, resting or migrating, are considered critical to the survival of the species unless population survey data suggests otherwise"*.

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species'. To date no critical habitat in WA has been listed under either Act. No provision is made under the TPWC Act for listing critical habitat.

Table 3: Biologically important areas – Fishes and Sharks

Species	Scientific name	Aggregation area and use	Specific geographic locations for species
Whale shark	*Rhincodon typus*	Foraging (high density prey) – Ningaloo Reef Foraging – Wider Ningaloo Region	Ningaloo Marine Park and adjacent Commonwealth waters Northward from Ningaloo along 200 m isobath

6. Marine Reptiles

Seven species of listed marine reptiles under the Commonwealth EPBC Act are known to occur in Australian waters in the EMBA, according to the Protected Matters search (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023). An examination of the species profile and threats database (DoEE 2024) showed that some listed reptile species are not expected to occur in significant numbers in the marine and coastal environments in the EMBA due to their terrestrial distributions. Hence, these species are not discussed further.

Of the remaining reptile species identified in the Protected Matters search (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023), seven are listed as threatened, and five also listed as migratory. These species are show in **Table 4** along with their WA conservation listings (as applicable)[3]. BIAs within the EMBA area discussed in **Table 6**.

Table 4: EPBC listed marine reptile species in the EMBA

Species	Conservation Status				Likelihood of occurrence in EMBA	BIA in EMBA
	EPBC Act 1999	BC Act 2016	Other WA Conservation Code	TPWC Act 1976		
Green turtle (*Chelonia mydas*)	Vulnerable Migratory	Vulnerable	-	Listed nationally	Breeding known to occur within area	Yes – refer to **Table 6**

[3] An overview of WA fauna conservation codes is provided in **Section 5** (fish and sharks).

Species	Conservation Status				Likelihood of occurrence in EMBA	BIA in EMBA
	EPBC Act 1999	BC Act 2016	Other WA Conservation Code	TPWC Act 1976		
Flatback turtle (*Natator depressus*)	Vulnerable Migratory	Vulnerable	-	Listed nationally	Breeding known to occur within area	Yes – refer to **Table 6**
Hawksbill turtle (*Eretmochelys imbricata*)	Vulnerable Migratory	Vulnerable	-	Vulnerable	Breeding known to occur within area	Yes – refer to **Table 6**
Loggerhead turtle (*Caretta caretta*)	Endangered Migratory	Endangered	-	Vulnerable	Breeding known to occur within area	Yes – refer to **Table 6**
Leatherback turtle (*Dermochelys coriacea*)	Endangered Migratory	Vulnerable	-	Critically Endangered	Breeding likely to occur within area	Yes – refer to **Table 6**
Short-nosed seasnake (*Aipysurus apraefrontalis*)	Critically Endangered	Critically Endangered	-	-	Species or species habitat known to occur within area	None - No BIA defined
Leaf-scaled seasnake (*Aipysurus foliosquama*)	Critically Endangered	Critically Endangered	-	-	Species or species habitat known to occur within area	None - No BIA defined

6.1. Marine Turtles

Five species of marine turtle occur in, use the waters, and nest on sandy beaches, in and around the EMBA. These are the green turtle (*Chelonia mydas*), flatback turtle (*Natator depressus*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*) and leatherback turtle (*Dermochelys coriacea*) (**Table 4**).

These five species are listed on the EPBC Act List of Threatened Species as either ‘endangered’ or ‘vulnerable’ and all five species are also listed as ‘migratory’.

A summary of the different habitat types used during the various life stages of marine turtle species identified in the EMBA is given in **Table 5.**

Table 5: Summary of habitat types for the life stages of the six marine turtle species in the EMBA (DSEWPaC, 2012b)

Life Stage		Green turtle	Flatback turtle	Hawksbill turtle	Loggerhead turtle	Leatherback turtle
Post-hatchling		Open ocean pelagic habitats (poorly studied for Australian populations)	Coastal waters (poorly studied for Australian populations)	Open ocean pelagic habitats (poorly studied for Australian populations)	Pelagic (poorly studied for Australian populations)	Pelagic (no data for Australian populations)
Adult	Mating	Offshore from nesting beaches.	Currently unknown for North West Shelf region.	Offshore from nesting beaches.	Little is known for North West Shelf region but expected to occur either en-route or adjacent to nesting beaches.	Not recorded within North West Shelf region.
	Nesting	Typically, high energy, steeply sloped beaches with deep sand and deep-water approach.	Typically, low-energy beaches that are narrow with a low to moderate slope. Beach approach obstructed by broad intertidal mud or limestone platforms.	Typically beaches close to nearshore coral reefs and sediment comprised of coarse sand and coral rubble.	Poorly studied for North West Shelf region by generally prefer high energy, relatively narrow, steeply sloped, coarse-grained beaches.	Not recorded within North West Shelf region.
	Internesting	Shallow coastal waters within several km of nesting beach. Internesting buffers of 20 km identified around all nesting habitats.	Shallow nearshore waters within 5-60 km of nesting beach. Internesting buffers of 40-60 km identified around all nesting habitats.	Shallow coastal waters within several kilometres of nesting beach. Internesting buffers of 20 km identified around all nesting habitats.	Shallow coastal waters within several kilometres of nesting beach. Internesting buffers of 20 km identified around all nesting habitats.	Danger Point, Cobourg Peninsula. 20 km internesting buffer around nesting sites
	Foraging	Neritic habitats associated with seagrass and algae, and mangrove habitats.	Turbid, shallow inshore waters, subtidal, soft-bottomed habitats of the continental shelf.	Subtidal and intertidal coral and rocky reef habitats of the continental shelf.	Subtidal and intertidal coral and rocky reefs, seagrass and deeper soft-bottomed habitats of the continental shelf.	Mostly pelagic but will forage close to shore and over continental shelf in temperate waters.

6.1.1. Loggerhead Turtle

The loggerhead turtle (*Caretta caretta*) has a worldwide distribution, living and breeding in subtropical to tropical locations (Limpus 2008b). Breeding aggregations in Australia occur on both the east coast (Queensland and NSW) and the west. The annual nesting population in Western Australia is thought to be 3,000 females annually (Baldwin et al. 2003), and this is considered to support the third largest population in the world (Limpus 2008b). Loggerhead turtles have one genetic breeding stock within Western Australia (Commonwealth of Australia 2017a).

The WA distribution of sandy beach nesting areas extends from Shark Bay to the southern area of the North West Shelf, with occasional late summer nesting crawls recorded as far north as Barrow and Varanus Islands and the Lowendal and Rosemary Islands (DSEWPaC 2012d). Major nesting locations include the Muiron Islands, the Ningaloo Coast south to Carnarvon and the islands around Shark Bay, which includes Dirk Hartog Island, one of the principal nesting and internesting sites in WA (Limpus 2008b). The Recovery Plan for Marine Turtles in Australia (2017) identifies the Muiron Islands (as a principal rookery), and all waters within a 20 km radius as habitat critical to the survival of loggerhead turtles (Commonwealth of Australia 2017a).

Estimates of up to 5,000 female loggerhead turtles have been predicted within the Ningaloo Marine Park and Muiron Islands Marine Management Area (Waayers 2010). Earlier surveys found higher proportions of nesting loggerheads in the southern areas of the reserves (CALM 2005a). Aerial surveys conducted in 2000 and 2001 in the Exmouth region recorded only 12 sightings in Commonwealth waters and these turtles were most likely loggerheads (BHP 2005). In a survey commissioned by Santos around the islands in the Exmouth Region, loggerhead turtles were recorded nesting on Flat Island north of the Exmouth Gulf which was the first time they had been recorded in that location (Astron 2014). Loggerhead nesting and breeding occurs from November to March, with a peak in late December/early January (Limpus 2008b).

Foraging areas are widespread for loggerhead turtle populations and migrations from nesting to feeding grounds can stretch thousands of kilometres, including feeding grounds as far north as the Java Sea of Indonesia for the WA population (Limpus 2008b). Loggerhead turtles are carnivorous and feed primarily on benthic invertebrates from depths of up to approximately 50 m to near shore tidal areas including areas of rocky and coral reef, muddy bays, sand flats, estuaries and seagrass meadows (Limpus 2008b).

Loggerhead turtles from both WA and eastern Australian have been recorded foraging in the NT, and further afield in Indonesia and Papua New Guinea (Perez et al., 2022; Pendoley, 2023).

Figure 6 illustrates the BIAs and habitat critical (draft) for loggerhead turtles (as defined in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017a).

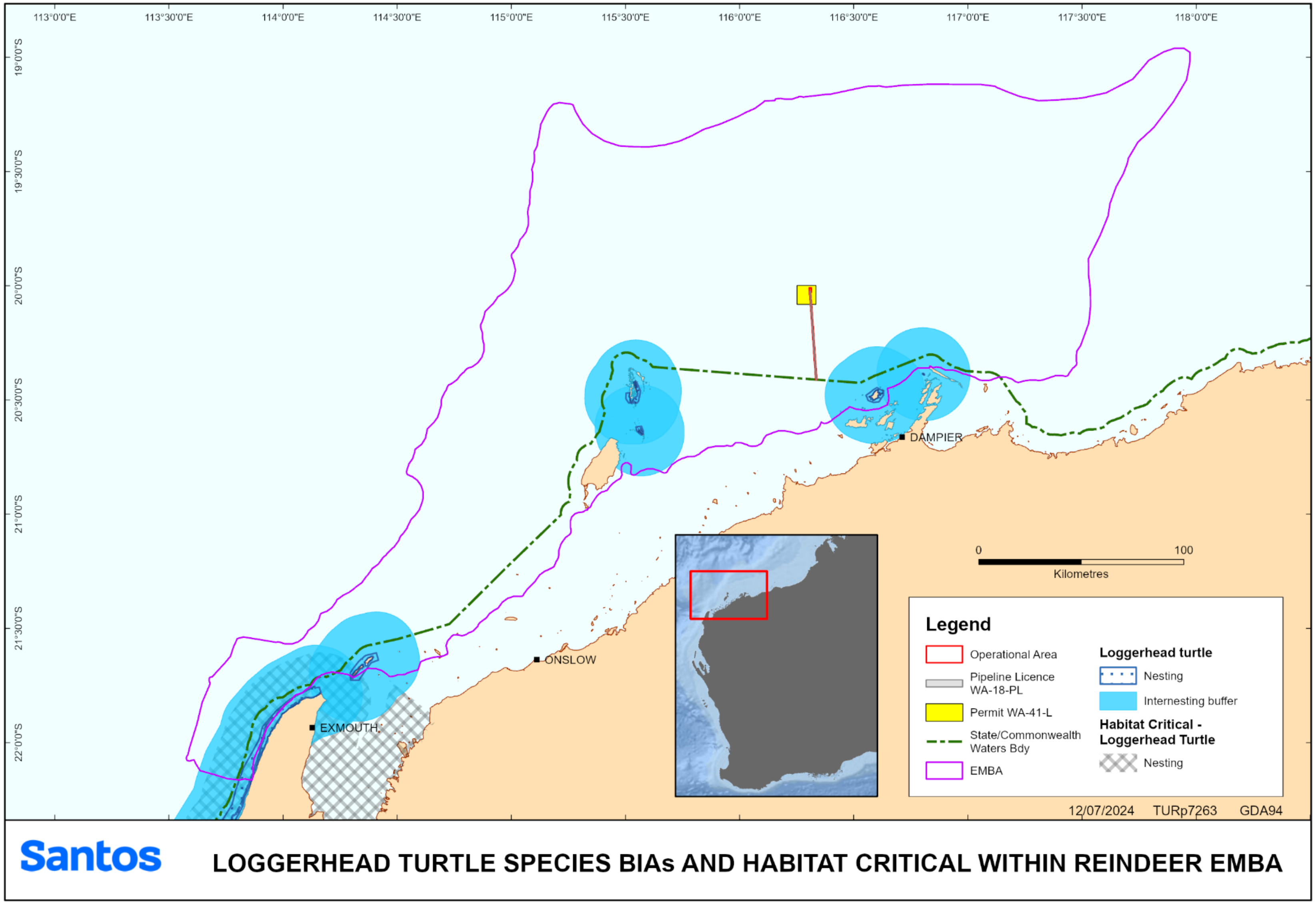


Figure 6: Biologically Important Areas and Habitat Critical – Loggerhead Turtle

6.1.2. Green Turtle

Australian population of green turtles is estimated to be approximately 70,000 and is divided into seven genetically distinct breeding aggregations. The species is widespread and abundant in WA and NT waters with an estimated 20,000 individuals occurring, arguably the largest population in the Indian Ocean (Limpus 2008a). There are three distinct breeding stocks in WA waters which include: the North west Shelf stock, the Scott-Browse stock and the Ashmore Stock (Commonwealth of Australia 2017a).

The North west Shelf population is one of the largest in the world and the most significant rookery is the western side of Barrow Island (Prince 1994, Limpus 2008a). Other principal rookeries include the Lacepede Islands, Montebello Islands, Dampier Archipelago, Browse Island and North West Cape (Prince 1994, Limpus 2008a, DSEWPaC 2012b). See **Table 6** for a complete list.

Surveys by Waayers (2010) within the Ningaloo Marine Park and Muiron Islands Marine Management Area estimated up to 7,500 female green turtles used these areas. In 2014, Santos commissioned a survey of the islands in the Exmouth Region which found that North and South Muiron Islands were significant nesting sites for green turtles with over 100 green turtles nesting overnight on one beach at North Muiron Island (Astron 2014). The green turtle is also known to breed in large numbers in the dunes above the extensive beaches found on Serrurier Island, with counts indicating the island supports the second largest rookery in the Pilbara (Oliver 1990).

Lower density green turtle nesting has also been recorded on Jurabi coast, Thevenard Island, Lowendal Islands and in Exmouth Gulf (Limpus 2008a). Only low numbers of green turtles have been observed nesting on Varanus Island, as well as Airlie Island (Pendoley Environmental 2011). From monitoring undertaken in 2016/17 by Santos on Varanus Island; three green turtles were observed to nest over a four-week tagging effort (Astron 2017).

Green turtle nesting abundance and timing fluctuates significantly from year to year depending on environmental variables, locality and food availability (Pendoley Environmental 2011). Nesting of green turtles has been recorded from August to March on Serrurier Island (Woodside 2002), from December to March along coast adjacent to Ningaloo (CALM 2005) and from October to February on Varanus Island (Pendoley Environmental 2011). On Barrow Island, mating aggregations may commence from October with peak nesting from December to January, with hatchlings emerging through summer and early autumn. However, nesting on Barrow Island has been recorded all year round (Chevron 2005 and 2008, Pendoley 2005). Nesting on the Scott Reef-Sandy Islet and Browse Island has been observed all year round with peaks between December and January (Commonwealth of Australia 2017a).

The re-nesting period for female green turtles is approximately five years (Hamann et al. 2002).

Green turtles spend the first five to ten years of their life drifting on ocean currents, before moving to reside in shallower benthic habitats, including tropical coral and rocky reefs and seagrass beds. Green turtles have been known to migrate more than 2,600 km between feeding and breeding grounds (Limpus 2008a).

Green turtles are omnivores, mainly feeding in shallow benthic habitats on seagrass and/ or algae, but are also known to feed on sponges, jellyfish and mangroves (Limpus 2008a). Green turtles are unlikely to forage or dwell within deeper offshore waters due to the water depths; however, they may occasionally migrate through it with 86 % of post-nesting turtles being found to migrate to neritic foraging grounds and 14 % having local residency to their rookery in Western Australia (Ferriera et al., 2020).

Ferriera et al. (2020) spatial examination of inter-nesting green turtles found the existing BIA for encompassed the spatial extent, however the BIA is likely largely underestimated for foraging areas.

Figure 7 illustrates the BIAs and habitat critical (draft) for green turtles (as defined in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017a).

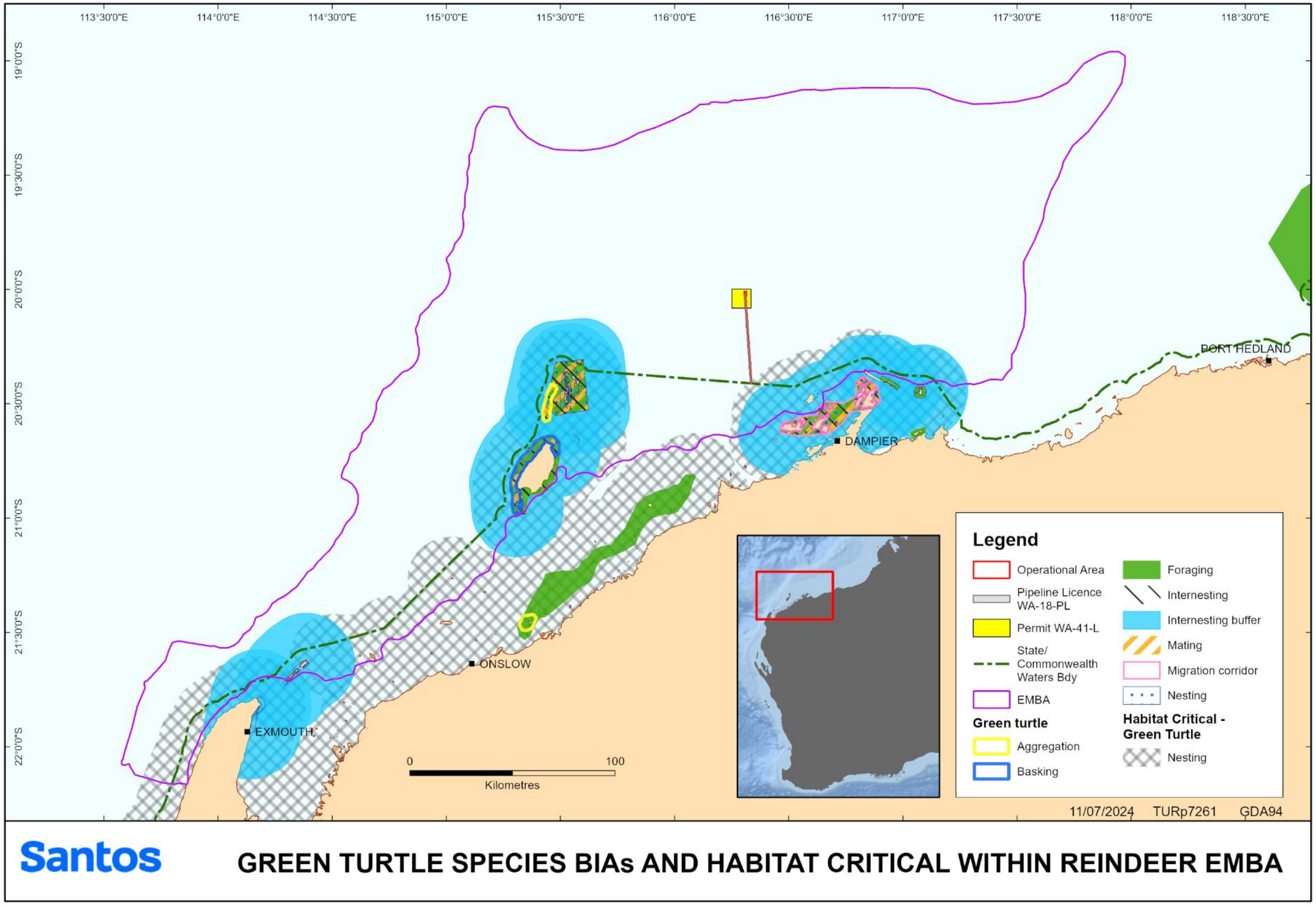


Figure 7: Biologically Important Areas and Habitat Critical – Green Turtle

6.1.3. Hawksbill Turtle

Hawksbill turtles (*Eretmochelys imbricata*) have a global distribution throughout tropical and sub-tropical marine waters. The Western Australian stock is concentrated on the North West Shelf (Dampier Archipelago) (Limpus 2009a) and is considered to be one of the largest hawksbill populations remaining in the world. The estimated number of nesting hawksbill turtles in WA waters is between 2,000 and 4,500 individuals (Morris 2004). There is a second major population of Hawksbill turtles in Australia, which is genetically isolated from the North West Shelf population located along the Northern Territory coast and north-eastern Queensland (Northern Territory Government, n.d).

In WA, their nesting range is relatively small and extends from the Muiron Islands to the Dampier Archipelago, a distance of approximately 400 km. The most significant breeding areas, that support hundreds of nesting females annually, are around sandy beaches within the Dampier Archipelago, Montebello Islands, Lowendal Islands and Barrow Island (Pendoley 2005, Limpus, 2009a).

The largest known nesting area for the North West Shelf population is the sandy shoreline of Rosemary Island, within the Dampier Archipelago, particularly on the north-western side of the Island. It is believed that the Rosemary Island rookery may support up to 1,000 nesting females annually (Limpus 2009a). Low density nesting is also known from Barrow Island, Airlie Island, Muiron Islands and North West Cape/ Ningaloo coast (Cape Range) (Limpus 2009a). Nesting hawksbills have also been found on NE Regnard Island and SW Regnard Island, confirming the Regnard Islands as hawksbill rookeries (Pendoley Environmental 2009).

The hawksbill turtle nesting population within the Exmouth region is also considered important as the populations in Western Australia represent the largest remaining population in the Indian Ocean (CALM 2005). The best estimate of numbers within the Ningaloo Marine Park and Muiron Islands Marine Management Area is between 20–700 individuals (Waayers 2010).

A snapshot survey of Varanus Island and the Lowendal Islands conducted for Santos during October 2012 found the five most frequented beaches by hawksbills, based on the track counts, were Beacon Island *(n*=43), Parakeelya (*n*=41), Kaia (*n*=40), Rose (*n*=30) and Pipeline (*n*=28). Results of the October 2012 three-day track census program showed that Beacon Island also hosted the highest daily number of overnight emergences by hawksbills and is therefore an important nesting beach for hawksbill turtles (Pendoley Environmental 2013).

On Varanus Island, hawksbill turtle nesting activity is predominantly distributed on the island’s east coast, including Pipeline, Harriet, and Andersons beaches (Pendoley Environmental 2019). Individual hawksbill turtles appear to show a strong fidelity to these beaches, often returning to the same beach to nest within the season (Pendoley Environmental 2019). Between 1986 and 2019, a total of 571 individual hawksbill turtles were tagged on Varanus Island. Recent baseline data was collected at the Montebello and Dampier AMPs by Keesing (2019) showing that only one hawksbill turtle was identified during the survey at the Dampier AMP only. No marine turtle species were identified during the survey at Montebello AMP.

Nesting is reported to occur between October and February in WA (Commonwealth of Australia 2017a). Hawksbill turtles have been observed breeding on the North West Shelf between July and March with peak nesting activity around the Lowendal Islands between October and December (Limpus 2009a).

Female hawksbills skip annual breeding opportunities (Kendall & Bjorkland 2001), presumably due to high energy demands of breeding (Chaloupka & Prince 2012).

Individuals may migrate up to 2,400 km between their nesting and foraging grounds (DSWEPaC 2012a), however a recent tagging study showed that turtles migrating from WA rookeries remain on the continental shelf (< 200 m depth) and within Australian waters during their inter-nesting, migrating and foraging phases (Fossette et al. 2021). Satellite tracking of nesting turtles on Varanus Island (32 km) and Rosemary Island has shown adult turtles to feed between 50 and 450 km from their nesting beaches (DSWEPaC 2012a).

Adults tend to forage in tropical tidal and sub-tidal coral and rocky reef habitat where they feed on an omnivorous diet of sponges, algae, jelly fish and cephalopods (DSWEPaC 2012a). Hawksbill turtles are unlikely to spend significant time within offshore waters as it is too deep to act as a feeding ground. However, it is likely they may migrate through those areas.

In order to better quantify and map the important areas used by Hawksbill turtles, AIMS was engaged in 2020 to lead the North West Shoals to Shores Research Program. During this program, AIMS combined available existing satellite tracking data for 20 adult turtles with data from newly deployed satellite tags on 20 adults in the Lowendal Islands and Dampier Archipelago (AIMS, 2021). Results showed that critical habitat designated by the Australian Government for inter-nesting largely protects the nesting areas calculated (AIMS, 2021), however the existing foraging BIAs do not include the majority of foraging areas calculated (AIMS, 2021). While approximately 23% of the hawksbill turtles foraging distribution occurred within MPAs, the existing BIAs are largely underestimating the important foraging areas for the turtles (AIMS, 2021). This supports the results of a joint study conducted by Fossette et al. (Fossette et al. 2021), which found only 10% of foraging areas utilised by 42 nesting turtles (between 2000 and 2017) were encompassed by the designated foraging BIA. Fossette et al. (2021) found that the highest overlap of individual turtles occurred within the Migratory BIA corridor.

Figure 8 illustrates the BIAs and habitat critical (draft) for hawksbill (as defined in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017a).

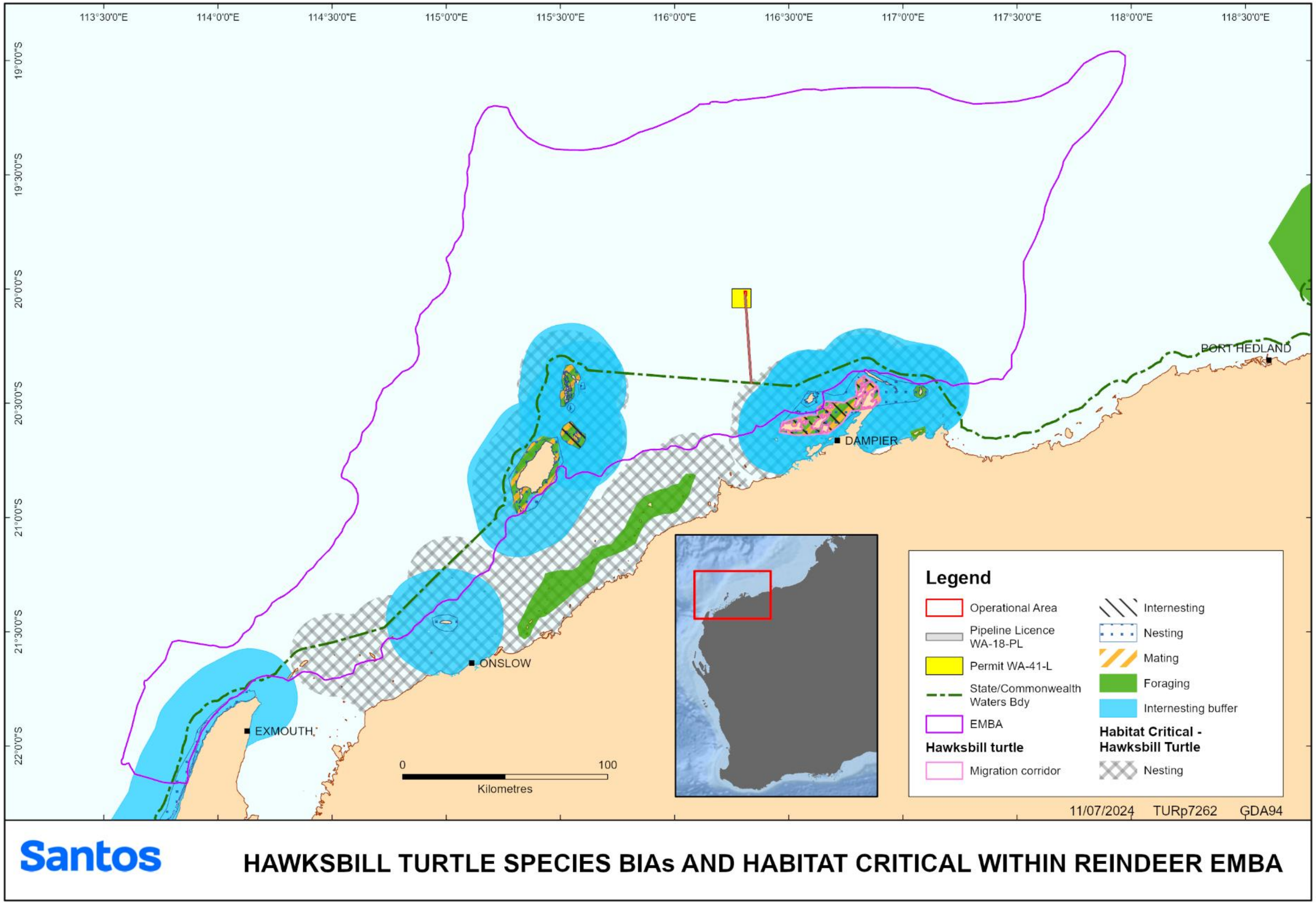


Figure 8: Biologically Important Areas and Habitat Critical – Hawksbill

6.1.4. Flatback Turtle

The flatback turtle (*Natator depressus*) has an Australasian distribution, with all recorded nesting beaches occurring within tropical to sub-tropical Australian waters. One third of the total breeding for the species occurs in Western Australia (WA) (Limpus, 2007). The management of the flatback turtle in Australia is broken up into five stocks currently described around Australia; eastern Queensland, Arafura Sea, Cape Domett, South-west Kimberley and Pilbara stocks (Commonwealth of Australia 2017). The Pilbara stock nests throughout the North West Shelf and is characterised by summer nesting (October to March), and the northern stock at Cape Domett breeds mainly in winter (July to September) (Commonwealth of Australia 2017a). The South-west Kimberley stock is also characterised by summer nesting. Populations in western NT are thought to nest all year round with nesting density reaching its peak in July. Populations in northern Australia also nest all year round, with nesting density reaching its peak between June and August (Limpus, 2007).

The southern WA nesting population of flatback turtles occurs from Exmouth to the Lacepede Islands off the Kimberley coast (DSEWPaC 2012c). On the North West Shelf, significant rookeries are centred on Barrow Island especially the east coast beaches (DSEWPaC 2012b).

Montebello Islands, Thevenard Island, Varanus Island, the Lowendal Islands, King Sound and Dampier Archipelago are also significant rookeries (Pendoley 2005, Limpus 2007, Pendoley Environmental 2011). Nesting is also widespread along the mainland beaches from Mundabullangana on the Pilbara coast north, including Cemetery Beach near Port Hedland, Eighty Mile Beach and to Broome (Limpus 2007, DSEWPaC 2012b).

Long term monitoring of flatback turtles nesting in the Port Hedland area, specifically at Cemetery Beach and Pretty Pool Beach, was undertaken between 2004 and 2014. Monitoring results indicated the main nesting season of flatback turtles in the area was between mid-October and January, which is consistent with other rookeries in the Pilbara region including Barrow Island, Mundabullangana, Karratha and Onslow (Waayers and Stubbs 2016). The onset of the nesting season appears to be relatively consistent each year and is thought to be associated with the southern movement of warmer sea surface temperatures along the northern WA coast.

There have been occasional records of nesting by flatback turtles on the Jurabi Coast and Muiron Islands (CALM 2005). During turtle surveys for Santos, WA flatback turtle nesting was recorded on Bessieres Islands (Astron 2014), Serrurier, Flat, Table and Round Island in previous surveys (Pendoley Environmental 2009). Flatback turtle tracks have been seen on Forty Mile beach and evidence of flatback nesting was recorded on the same beach the next day (Pendoley Environmental 2009). Previously the status of the flatback population(s) was undetermined and although not well quantified, it was estimated to be many thousands of females (Limpus 2007). However, Pendoley et al. (2014a, b) reported both Barrow Island and Mundabullangana flatback turtles as substantial reproductive populations with estimates of 1,512 and 1,461 nesting females annually respectively. Thevenard Island and Port Hedland were also identified as rookeries, but turtle nesting numbers are not known.

Satellite tracking of adult (female) flatback turtles shows they use a variety of inshore and offshore marine areas off the east and west coasts of Barrow Island. Females inter-nest close to their nesting beaches, typically in 0–10 m of water (Chevron 2008). However, flatback turtles also travel approximately 70 km and inter-nest in shallow nearshore water off the adjacent mainland coast, before returning to Barrow Island to lay another clutch of eggs. The average inter-nesting period is 13–16 days.

From long-term tagging studies on Varanus Island and Pendoley's observations, it appears that the nesting season for flatback turtles peaks in December and January with subsequent peak hatchling emergence in February and March. Flatbacks have been observed to nest on Varanus Island between November and February (Chevron 2008, Pendoley Environmental 2011 & 2013). Population monitoring of flatback turtles on Varanus Island, calculated from 16 seasons, indicates a mean population estimate of 226 (+/- 97). Modelled flatback turtle populations have shown a slight decline from 2008/09 to 2016/17, which is considered to be part of fluctuations in the natural cycle (Astron 2017). Flatback turtles tend to nest on all beaches on Varanus Island (Astron 2017). Flatback hatching and emergence success is noted as higher compared to that reported for other Western Australian rookeries (Pendoley et al. 2014; cited Astron 2017).

Unlike other sea turtles, the flatback turtle lacks a wide oceanic dispersal phase and adults tend to be found in soft sediment habitats within the continental shelf of northern Australia (DSEWPaC 2012b). Despite having geographically large foraging ranges (>1500 km), genetic differentiation suggests strong natal homing for both males and females (Turner Tomaszewicz et al., 2022). Little information is known on the diets of flatback turtles (DSEWPaC 2012b); however, they are believed to forage on primarily soft-bodied invertebrates (Commonwealth of Australia 2017a). Flatback turtles also differ from other species of sea turtles in maturing at a larger size and a likely younger age (<20 years) in comparison to other sea turtle species, indicating they may have a more rapid growth rate in their juvenile (similar to the leatherback turtle, a species with their own family) (Turner Tomaszewicz et al., 2022). This information from Turner Tomaszewicz et al., 2022 may provide valuable insight for ongoing population assessments and future recovery plans (Turner Tomaszewicz et al., 2022).

Figure 9 illustrates the BIAs and habitat critical (draft) for flatback turtles (as defined in the Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017a).

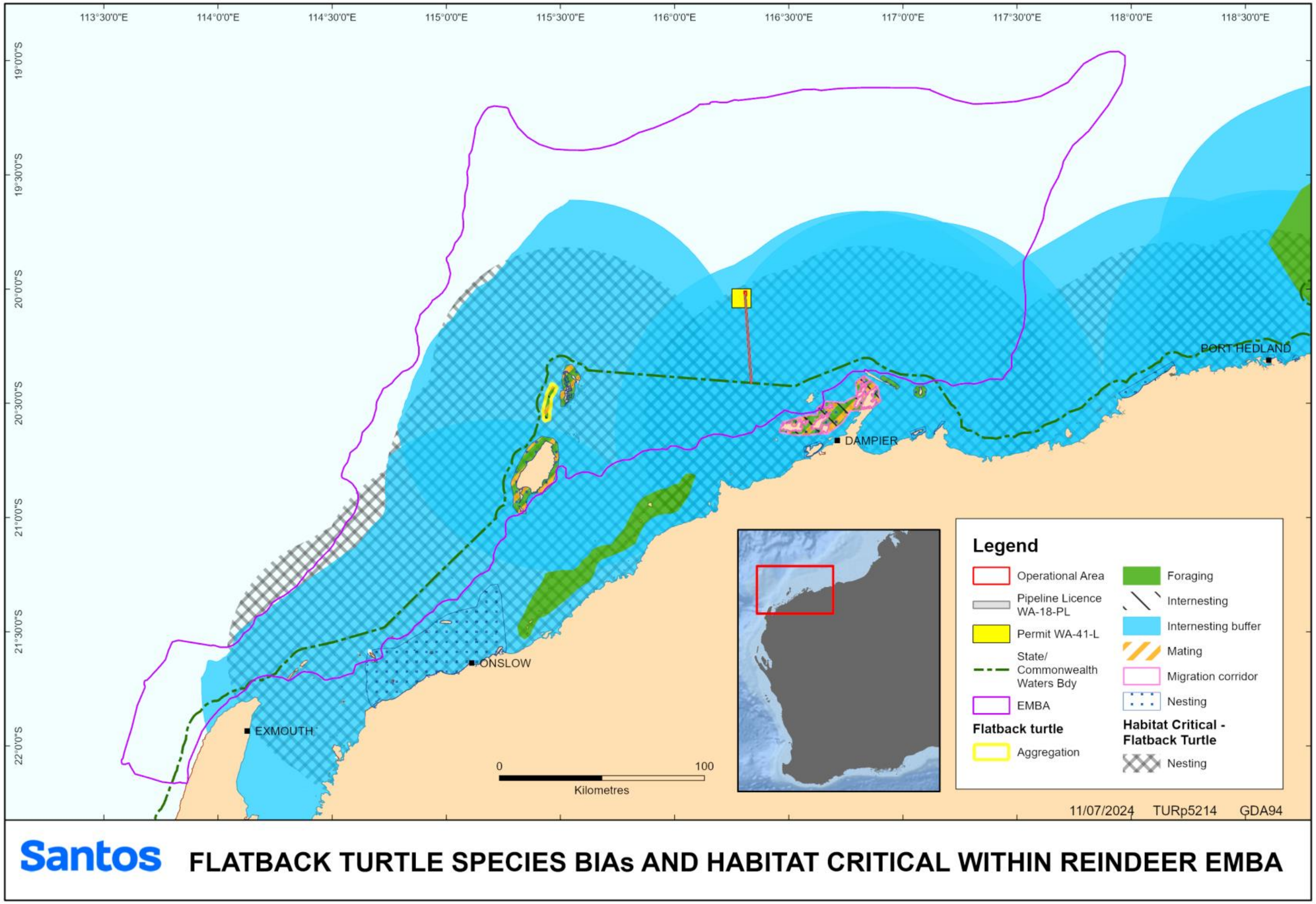


Figure 9: Biologically Important Areas and Habitat Critical – Flatback Turtle

6.1.5. Leatherback Turtle

The leatherback turtle *(Dermochelys coriacea*) has the widest distribution of any marine turtle and can be found from tropical to temperate waters throughout the world (Márquez 1990). There are no major leatherback turtle centres of nesting activity that have been recorded in Australia, although scattered isolated nesting (one to three nests per annum) occurs in southern Queensland and the Northern Territory (Limpus and McLachlin 1994).

There have been several records of leatherback turtles off the coast of WA, but no confirmed nesting sites (Limpus 2009c). Turtle observations have mainly occurred south of the North West Shelf area and in open waters (>200 m deep) (Limpus 2009c). Due to the lack of nesting sites around Australian coastal waters, it is presumed that leatherback turtles observed in Australian waters are migrating from neighbouring countries to utilise feeding grounds in Australia (Limpus 2009c).

The leatherback turtle will feed at all levels of the water column and is carnivorous feeding mainly on pelagic, soft-bodied marine organisms such as jellyfish, which occur in greatest concentrations in areas of upwelling or convergence (DSEWPaC 2012d). The leatherback turtle is a highly pelagic species with adults only going ashore to breed.

6.2. Seasnakes

Storr et al. (1986) estimate nine genera and 22 species of sea snakes occur in WA waters. Little is known of the distribution of individual species, population sizes or aspects of their ecology. Seasnakes are essentially tropical in distribution, and habitats reflect influences of factors such as water depth, nature of seabed, turbidity and season (Heatwole and Cogger 1993). Seasnakes are widespread throughout waters of the North West Shelf in offshore and nearshore habitats. They can be highly mobile and cover large distances or they may be restricted to relatively shallow waters and some species must return to land to eat and rest. In the north-west region of Western Australia, no BIAs have been designated for seasnakes.

Two species of seasnakes listed as threatened under the EPBC Act were identified in the Protected Matters search within the EMBA:

- Short-nosed seasnake (*Aipysurus apraefrontalis*)
- Leaf-scaled seasnake (*Aipysurus foliosquama*).

6.2.1. Short-nosed Seasnake

The short-nosed seasnake (*Aipysurus apraefrontalis*) is listed as critically endangered under the EPBC Act and the BC Act. It is a fully aquatic, small snake and is endemic to WA. It has been recorded from Exmouth Gulf, WA to the reefs of the Sahul Shelf, in the eastern Indian Ocean. This species is believed to show strong site fidelity to shallow coral reef habitats in less than 10 m of water, with most specimens having been collected from Ashmore and Hibernia reefs (Minton & Heatwole 1975, Guinea and Whiting 2005).

The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m (McCosker 1975, Cogger 2000). The species has been observed during daylight hours, resting beneath small coral overhangs or coral heads in 1–2 m of water (McCosker 1975). Guinea and Whiting (2005) reported that very few short-nosed seasnakes moved even as far as 50 m away from the reef flat and are therefore unlikely to be expected in high numbers in offshore, deeper waters.

6.2.2. Leaf-scaled Seasnake

The leaf-scaled seasnake *(Aipysurus foliosquama)* is listed as critically endangered under the EPBC Act and the BC Act. It occurs in shallow water (less than 10 m in depth), in the protected parts of the reef flat, adjacent to living coral and on coral substrates (DoE 2014). The species is found only on the reefs of the Sahul Shelf in WA, especially on Ashmore and Hibernia Reefs (Minton and Heatwole 1975). The leaf-scaled seasnake forages by searching in fish burrows on the reef flat (DoE 2014).

6.3. Biologically Important Areas/Habitat Critical – Marine Reptiles

Table 6 provides an overview of BIAs in the EMBA for marine reptiles, as identified by the DAWE (Commonwealth) and critical habitats identified in associated recovery plans. The DAWE may make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, relevant recovery plans are listed in **Section 13.2**.In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of habitat critical - habitat 'critical to the survival of the threatened species. To date no habitat critical in WA has been listed under either Act. No provision is made under the TPWC Act for listing critical habitat.

Table 6: Biologically Important Areas/Habitat Critical and geographic locations - reptiles

Species	Scientific name	Aggregation area and use	BIAs within EMBA	Habitat Critical within EMBA
Loggerhead turtle	*Caretta caretta*	Nesting, migration, foraging and internesting – islands and coastline of the Kimberley region and islands of the North West Shelf, Ningaloo coast and Jurabi coast	Lowendal Island Montebello Island Muiron Island Ningaloo Coast and Jurabi coast Rosemary Island	Exmouth and Ningaloo coast. 20 km internesting buffer
Green turtle	*Chelonia mydas*	Nesting, migration foraging, aggregation, mating, basking and internesting – Offshore islands in the Browse Basin, North West Shelf and Kimberley/Pilbara coastlines Mating/nesting – Dampier Archipelago Basking – Middle Island	Barrow Island Coral reef habitat west of the Montebello group. Extends the entire length of Montebellos Dampier Archipelago (islands to the west of the Burrup Peninsula) De Grey River area to Bedout Island Greens - inshore tidal and shallow subtidal areas around Barrow Island Hawksbills - shallow water coral reef and artificial reef (pipeline) habitat Middle Is. West Coast Barrow Island West Coast and North Coast Montebello Island - Hermite Island, NW Island, Trimouille Island Montebello Islands North and South Muiron Island String of islands between Cape Preston and Onslow, inshore of Barrow Island	Dampier Archipelago. 20 km internesting buffer Barrow Island, Montebello Islands, Serrier Island and Thevenard Island. 20 km internesting buffer Exmouth Gulf and Ningaloo coast. 20 km internesting buffer
Hawksbill turtle	*Eretmochelys imbricata*	Nesting, migration, mating, foraging and internesting – Offshore islands in the Browse Basin, North West Shelf and Kimberley/Pilbara coastlines Mating/ nesting/ internesting – Lowendal group, Montebello Islands	Barrow Island Dampier Archipelago (islands to the west of the Burrup Peninsula) Delambre Island (and other Dampier Archipelago Islands) Greens - inshore tidal and shallow subtidal areas around Barrow Island Hawksbills - shallow water coral reef and artificial reef (pipeline) habitat Lowendal Island Group Montebello Island - Hermite Island, NW Island, Trimouille Island Montebello Island, Trimoulle and NW islands Ningaloo coast and Jurabi coast Rosemary Island String of islands between Cape Preston and Onslow, inshore of Barrow Island Varanus Island	Cape Preston to mouth of Exmouth Gulf (including Montebello Islands and Lowendal Islands). 20 km internesting buffer Dampier Archipelago (including Delambre Island and Rosemary Island). 20 km internesting buffer
Flatback turtle	*Natator depressus*	Nesting, migration, mating, aggregation, foraging, internesting – Islands of the North West Shelf and the Pilbara/ Kimberley coastlines Mating, nesting – Barrow Island	Barrow Island Coral reef habitat west of the Montebello group. Extends the entire length of Montebellos Dampier Archipelago (islands to the west of the Burrup Peninsula) Delambre Island Montebello Island - Hermite Island, NW Island, Trimouille Island String of islands between Cape Preston and Onslow, inshore of Barrow Is	Dampier Archipelago, including Delambre Island and Hauy Island. 60 km internesting buffer Barrow Island, Montebello Islands, coastal islands from Cape Preston to Locker Island. 60 km internesting buffer Soldier Point to Pirlangimpi including Seafull Island. 60 km internesting buffer Brace point to One Tree Point, including all offshore islands. 60 km internesting buffer
Leatherback turtle	*Dermochelys coriacea*	None within EMBA	-	-

7. Marine Mammals

Thirteen species of listed marine mammals are known to occur in Australian waters in the EMBA, according to the Protected Matters search (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023).

Four species are listed as threatened and migratory and nine are listed as migratory under the Commonwealth EPBC Act (BIAs for marine mammals are discussed in **Table 9**. These species are shown in **Table 7** along with their conservation listing under the WA BC Act and TPWC Act (as applicable).

The section below gives further details on marine mammal species listed as threatened and migratory and a summary is presented in **Table 8**. Identified BIAs are presented in **Table 9**.

Table 7: Marine mammals listed as threatened or migratory under the EPBC Act

Species	Conservation Status				Likelihood of occurrence in EMBA	BIA in EMBA
	EPBC Act 1999	BC Act 2016	Other WA Conservation Code	TPWC Act 1976		
Sei whale (*Balaenoptera borealis*)	Vulnerable Migratory	Endangered	-	-	Foraging, feeding or related behaviour likely to occur within area	None – no BIA defined
Pygmy blue whale (*Balaenoptera musculus*)	Endangered Migratory	Endangered	-	-	Foraging, feeding or related behaviour known to occur within area Migration route known to occur within area	Yes – Refer to **Table 9**
Fin whale (*Balaenoptera physalus*)	Vulnerable Migratory	Endangered	-	-	Foraging, feeding or related behaviour likely to occur within area	None – no BIA defined
Southern right whale (*Eubalaena australis*)	Endangered Migratory	Vulnerable	-	-	Breeding known to occur within area	Yes – Refer to **Table 9**
Humpback whale (*Megaptera novaeangliae*)	Migratory	Special conservation interest and Migratory	-	Listed nationally	Breeding known to occur within area	Yes – Refer to **Table 9**

Species	Conservation Status				Likelihood of occurrence in EMBA	BIA in EMBA
	EPBC Act 1999	BC Act 2016	Other WA Conservation Code	TPWC Act 1976		
Sperm whale (*Physeter macrocephalus*)	Migratory	Vulnerable	-	-	Foraging, feeding or related behaviour known to occur within area	None - BIA not found in EMBA
Antarctic minke whale (*Balaenoptera bonaerensis*)	Migratory	Migratory	-	-	Species or species habitat likely to occur within area	None - BIA not found in EMBA
Bryde's whale (*Balaenoptera edeni*)	Migratory	Migratory	-	-	Species or species habitat likely to occur within area	None – no BIA defined
Killer whale (*Orcinus orca*)	Migratory	Migratory	-	-	Species or species habitat may occur within area	None – no BIA defined
Australian Humpback Dolphin (*Sousa sahulensis*)	Migratory (as *Sousa chinensis*)	Migratory	Priority 4	-	Breeding known to occur within area	None - BIA not found in EMBA
Spotted bottlenose dolphin (Arafura/Timor Sea populations) (*Tursiops aduncus*)	Migratory	Migratory	-	-	Species or species habitat known to occur within area	None - BIA not found in EMBA
Irrawaddy dolphin (Australian snubfin dolphin) (*Orcaella heinsohni*)	Migratory	Migratory	Priority 4	-	Species or species habitat known to occur within area	None - BIA not found in EMBA
Dugong (*Dugong dugon*)	Migratory	Migratory	-	-	Breeding known to occur within area	Yes – Refer to **Table 9**

7.1. Threatened and Migratory Species

7.1.1. Sei Whale

Sei whales have a worldwide, oceanic distribution and migrate between low-latitude tropical and subtropical regions during the winter and temperate and subpolar latitudes in summer (Leaper et al. 2008). Sei whales tend to be found further offshore than other species of large whales (Bannister et al. 1996).

Sei whales move between Australian waters and Antarctic feeding areas; however, they are only infrequently recorded in Australian waters (Bannister et al. 1996) and their movements and distribution in Australian waters is not well known (DAWE 2020a). There are no known mating or calving areas in Australian waters (Parker 1978 in DAWE 2020a). The National Conservation Values Atlas currently record no BIAs for this species (DAWE 2020b). Surveys of the Bonney Upwelling (outside of the EMBA) between 2000 and 2003 recorded sightings of sei whales feeding during summer and autumn, indicating that this is potentially an important feeding ground (DAWE 2020b).

7.1.2. Pygmy Blue Whale

Two sub-species of blue whale are recorded in Australian waters: the southern (or true) blue whale (*Balaenoptera musculus intermedia*) and the pygmy blue whale (*Balaenoptera musculus brevicauda*). Southern blue whales are believed to occur in waters south of 60°S and pygmy blue whales occur in waters north of 55°S (i.e. not in the Antarctic) (DEWHA 2008a). By this definition all blue whales in waters from Busselton to the NT are assumed to be pygmy blue whales and are discussed below.

Pygmy blue whale populations are distinguishable only acoustically as they do not display morphological differences (Leroy et al. 2021). Prior to 2020 there were believed to be three populations of the pygmy blue whale (B. m. brevicauda), however, evidence for a fourth pygmy blue whale acoustic population were found by Cerchio, S. et al. (2020), and a fifth was identified by Leroy et al. (2021).

Pygmy blue whales have a southern hemisphere distribution, migrating from tropical water breeding grounds in winter to temperate and polar water feeding grounds in summer (Bannister et al. 1996, Double et al. 2014), such as the Perth Canyon and adjacent waters (Rennie et al., 2009) and the Great Southern Australian Coastal Upwelling System (Möller et al., 2020). The WA migration path takes pygmy blue whales down the WA coast to coastal upwelling areas along southern Australia (Gill 2002) and south at least as far as the Antarctic convergence zone (Gedamke et al. 2007).

Tagging surveys have shown pygmy blue whales migrating northward relatively near to the Australian coastline (100 km) until reaching North West Cape after which they travelled offshore (240 km) to Indonesia (Double et al., 2014). Passive acoustic data documented pygmy blue whales migrating along the Western Australian shelf break (Woodside 2012). Tagging data collected by Gales et al. (2010) has provided the first definitive link between the blue whales that feed off the Perth Canyon and those that occur around Indonesia. This is movement is concordant with the proposed 'Tasmania to Indonesia' population described by Branch et al. (2007).

The northern migration passes the Perth Canyon from January to May and north bound animals have been detected off Exmouth and the Montebello Islands between April and August (Double et al. 2012a, McCauley & Jenner 2010). A noise monitoring study conducted in 2014-15 recorded pygmy blue whales moving in a northward direction in August 2014 and between late-May to early July 2015 (JASCO Applied Sciences, 2016; McPherson, Craig et al., 2015). During the southern migration, pygmy blue whales pass south of the Montebello Islands and Exmouth from October to the end of January, peaking in late November to early December (Double et al. 2012b). No detections of the species were made during the period of their southward migration during the noise monitoring study.

Generally, they appear to travel as individuals or in small groups based on acoustic data. For example, analysis of pygmy blue whale calls from noise loggers deployed around Scott Reef (2006 to 2009) for the Woodside Browse project showed that 78% of the calls were from lone whales, 18% were from two whales and 4% were from three or more whales (McCauley 2011; Woodside 2014).

Pygmy blue whales appear to feed regularly along their migration route (i.e. at least once per week or more frequently) and are likely to have multiple food caches along their migratory route (e.g. Rowley Shoals and Ningaloo Reef) (ConocoPhillips 2018).

Recognised feeding areas of significance to this species, located within the EMBA include Ningaloo Reef and the Perth Canyon (DoE 2015). The Ningaloo Reef area has the capacity to offer feeding opportunities to pygmy blue whales through unique biophysical conditions able to support large biomasses of marine species (Double et al. 2014).

Surface lunge feeding of pygmy blue whales has been observed at North West Cape and Ningaloo Reef in June (C. Jenner & M-N Jenner, unpublished data, 2001 in Double et al. 2014). Outside of the recognised feeding areas, possible foraging areas for pygmy blue whales include the greater region around the Perth Canyon, off Exmouth and Scott Reef in WA (DoE 2015a). These steep gradient features tend to stimulate upwelling and, therefore increased productivity (seasonally variable) (ConocoPhillips 2018). Hence, they provide a favourable foraging area.

Breeding areas have not yet been identified; however, it is likely that pygmy blue whales calve in tropical areas of high localised production such as deep offshore waters of the Banda and Molucca Seas in Indonesia (Double et al. 2014, DAWE 2020). There are no known breeding areas of significance to blue whales in waters from Busselton to the NT.

The BIA for pygmy blue whale is detailed in **Table 9** and depicted in **Figure 10.** However, a recent study by Thums et al. (2022) used a combination of passive acoustic monitoring of the Northwest Australian coast (46 instruments from 2006 to 2019) and satellite telemetry data (22 tag deployments from 2009 to 2021) to model the spatial extent of pygmy blue whale high use areas for foraging and migration and compared these areas to the BIA. The synthesis of data indicated that pygmy blue whales extensively use the continental slope habitat rather than the continental shelf habitat off Western Australian coast compared to southern Australia.

Thums et al. (2022) described three important foraging (and/or resting/breeding) areas, including; The Perth Canyon and vicinity, the shelf edge off Geraldton and; the shelf edge from Ningaloo Reef to the Rowley Shoals (not continuous).The study found that the Foraging BIA off the south-west of Western Australia encompassed 83 % of the most important areas in that region, however; the ‘Annual High Use Foraging’ BIA within that BIA only encompassed 7 % of the most important area.

The most significant overlaps were seen with the Migration BIA, whereby the most important migration area had an 82 % overlap with the part of the Migration BIA that occurs in Australia. Thums et al. (2022) also stated that the available data indicated that the East Indian Ocean pygmy blue whales spent up to 124 days in Indonesian and Timorese waters (34 % of annual cycle) and this area may also be the calving ground for this population.

The Australian Government may now have to consider this quantitative assessment of important areas in future reviews of the BIAs (Thums et al. 2022).

Santos

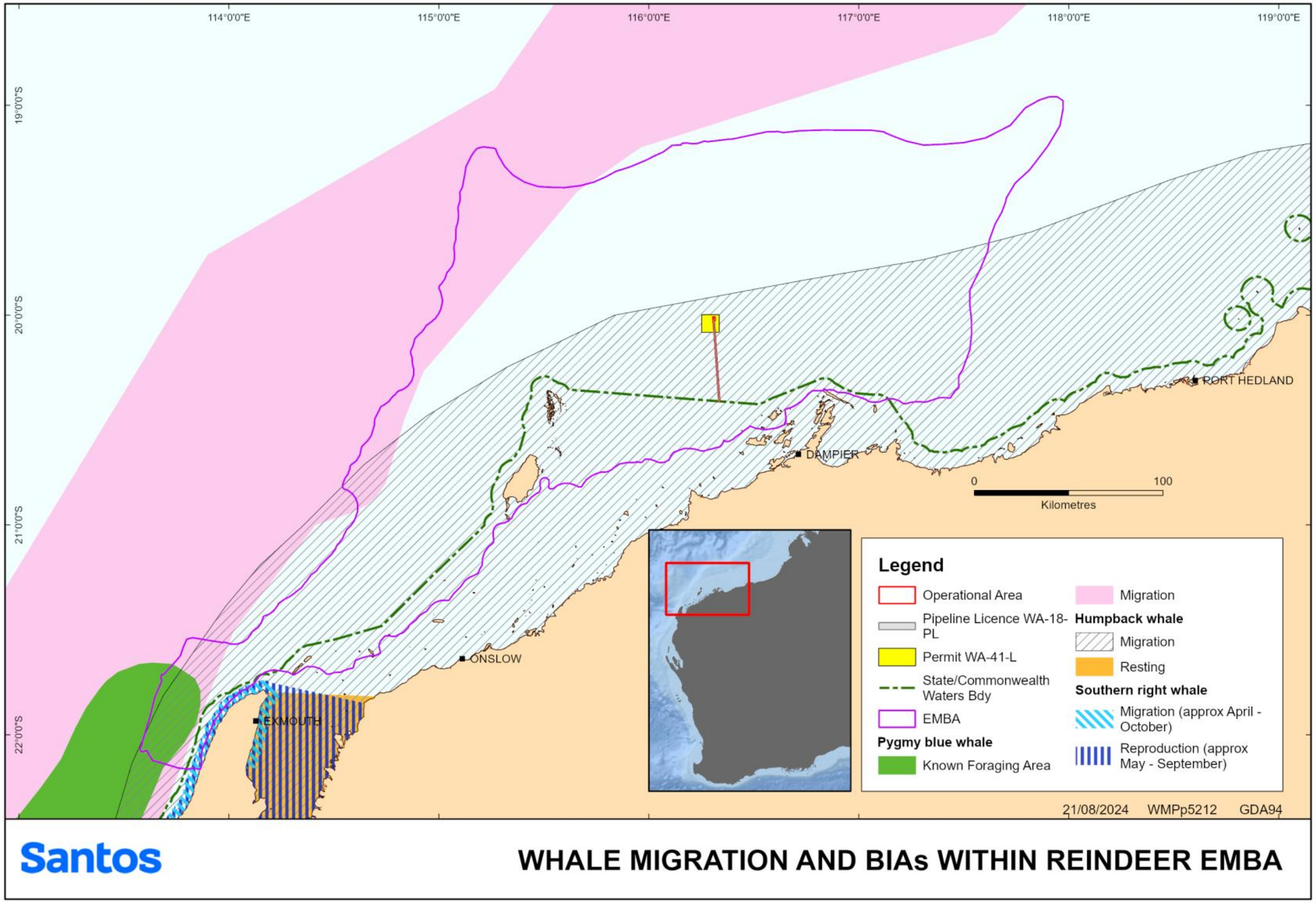


Figure 10: Whale Migration and Biologically Important Areas

7.1.3. Fin Whale

Fin whales have a worldwide distribution generally in deeper waters, with oceanic migrations between warm water breeding grounds and cold-water feeding grounds.

The fin whale distribution in Australia is not clear due to the sparsity of sightings. Information is known primarily from stranding events and whaling records. According to the Species Profile and Threats database (DAWE 2020a); fin whales are thought to be present from Exmouth, along the southern coastline, to southern Queensland.

Migration paths are uncertain but are not thought to follow Australian coastlines (Bannister et al. 1996). There is insufficient data to prescribe migration times for fin whales.

There are no known mating or calving areas in Australian waters (DoEE 2019a) and no BIAs for the fin whale are currently identified by the National Conservation Values Atlas (DAWE 2020b).

7.1.4. Southern Right Whale

The southern right whale is present in the southern hemisphere between approximately 30° and 60°S. The species feeds in the Southern Ocean in summer, moving close to shore in winter.

In Australian waters, southern right whales range from Perth, along the southern coastline, to Sydney. Sightings have been recorded as far north as Exmouth although these are rare (Bannister et al. 1996).

Migration occurs along the WA coastline between April and October, with a couple of emerging aggregation areas at Flinders Bay and Hassell Beach (DSEWPaC 2012). Calving occurs within the Exmouth Gulf region (DAWE 2020). Further details of southern right whale are show in **Figure 10**.

7.1.5. Humpback Whale

Humpback whales have a worldwide distribution, migrating along coastal waters from polar feeding grounds to subtropical breeding grounds. Geographic populations are distinct and at least six southern hemisphere populations are thought to exist based on Antarctic feeding distribution and the location of breeding grounds on either side of each continent (Bannister et al. 1996). The largest known population of humpback whales breeds along the coast of Western Australia (Branch, 2011, Salgado Kent et al., 2012, IWC, 2014) and has a recognised resting ground in the Exmouth Gulf (Ivine & Kent 2018). The population of humpback whales migrating along the WA coastline was recently estimated to be greater than 33,000 whales and likely increasing at exceptionally high growth rates between 10–12 % (Hedley et al. 2011, Salgado Kent et al. 2012).

Humpback whale populations have increased since being placed on the threatened species list for exploitation from whaling, resulting in a higher abundance of species off our Western Australian coastline. Effective from 26/02/2022, Humpback whales are no longer classed as vulnerable under the EPBC Act, however; they remain a Matter of National Environmental Significance as a listed Migratory Species and Cetacean under EPBC Act Division 3, where it is an offence to kill, injure, take, trade, keep, move or interfere with a cetacean. Humpback whales have been able to thrive and increase in numbers despite the heavy oil and gas exploration. A study presented by Bejder et al. (2016) has prompted a review of the species being down listed under Commonwealth legislation and regulations, as they are not eligible for listing as a threatened species under all statutory criteria. The west coast Australian humpback whale population migrates from Southern Polar Ocean 'summer' feeding grounds to their northern tropical 'winter' calving/ breeding grounds in coastal waters of the Kimberley. The northern migration tends to follow deeper waters of the continental shelf, whilst the southward migration concentrates whales closer to the mainland (Jenner et al. 2001; Irvine et al., 2018). Recent satellite tagging of southbound humpback whales indicate that whales generally migrated close to the coastline, within a few tens of kilometres of shore and in a corridor frequently less than 100 km (Double et al. 2010). Aerial surveys and noise logger recordings undertaken for Chevron's Wheatstone Project indicated that the main distribution of humpback whales was sighted at an average distance of 50 km from the mainland during the northern migration and 35 km during the southbound migration (RPS 2010a). Woodside have conducted aerial surveys that have confirmed that the reported distribution of migrating humpback whales off the North West Cape is consistent with baseline surveys first conducted in 2000 to 2001 (RPS, 2010 in Woodside 2020).

The precise timing of the migration varies between years by up to six weeks, influenced by water temperature, sea ice distribution, predation risk, prey abundance and the location of feeding grounds (DEWR 2007).

Peak northward migration across the North West Shelf is identified as from late July to early August, and peak southward migration from late August to early September (DoEE 2015c). Data collected between 1995 and 1997 by the Centre for Whale Research indicates that the period for peak northern migration into the calving grounds in the Kimberley is mid to late July. The peak for southern migration is in the first half of September (Jenner et al.

2001). Actual timing of annual migration may vary by as much as three weeks from year to year due to food availability in the Antarctic (DMP 2003).

Satellite tagging data collected for migrating northbound humpback whales identified a consistent narrow inshore distribution, unlike the southward migration. There was little evidence that the whales tended to venture further from shore and into deeper water at any point on their northward migration. Whales were seen with calves off the North West Cape outside the 'calving grounds; of Lacepede Islands to Camden Sound. This indicates some potential for this area being used as a 'calving site' as well as a migratory corridor. Consequently, the region from the Lacepede Islands to Camden Sound should not be seen as the exclusive 'calving ground' for this population (Double et al. 2012b).

Details on the BIA for humpback whales are provided in **Table 9** and depicted in **Figure 10**.

7.1.6. Sperm Whale

Sperm whales typically occur in WA along the southern coastline between Cape Leeuwin and Esperance (Bannister et al. 1996). Sperm whales are distributed worldwide in deep waters (greater than 400 m) off continental shelves and sometimes near shelf edges, averaging 20 to 30 nautical miles offshore (Hooker et al.1999, Pirotta et al., 2011). The sperm whale is known to migrate northwards in winter and southwards in summer, however, detailed information on the distribution of sperm whales is not available for the timing of migrations. Sperm whales have been recorded in deep water off the North West Cape on the west coast of Western Australia (RPS 2010b) and appear to occasionally venture into shallower waters in other areas (RPS 2010b).

7.1.7. Antarctic Minke Whale

The Antarctic minke whale is distributed throughout the Southern Hemisphere from 55°S to the Antarctic ice edge during the austral summer and has been recorded in all Australian States (Bannister et al. 1996; Perrin & Brownell 2002). Detailed information on timing and location of migrations and breeding grounds on the west coast of Australia is largely unknown. However, it is believed that the Antarctic minke whale migrates up the WA coast to approximately 20°S during Australian winter to feed and possibly breed (Bannister et al. 1996).

7.1.8. Bryde's Whale

Bryde's whales (*Balaenoptera edeni;* Migratory) are distributed year-round across tropical and warm temperate waters with individuals recorded in all Australian states, except the NT (Ceccarelli et al., 2011; Kato 2002). The species typically moves between 40 °N and 40 °S, with these movements seeming to be primarily linked to prey availability (DoE, 2023k). Two forms are recognised: inshore and offshore Bryde's whales. It appears that the inshore form is restricted to the 200 m depth isobar whilst the offshore form is found in deeper waters of 500-1,000 m (DoEE 2019c). Both forms are expected to be found in zones of upwelling where they feed on shrimp like crustaceans (Bannister et al. 1996). Little is known about the population abundance of Bryde's whale, the location of exact breeding and calving grounds and large-scale migration patterns (DoEE 2019c). It is however, suggested that the offshore form migrates seasonally, heading towards warmer tropical waters during the winter.

7.1.9. Killer Whale

The killer whale has a widespread global distribution and has been recorded in waters of all Australian states/territories (Bannister et al. 1996). Whilst more commonly found in cold, deeper waters, killer whales have been observed along the continental slope, shelf and shallower coastal areas. Killer whales are known to make seasonal movements and are most likely to follow the migratory routes of their prey, however, little is known about these movements (DoEE, 2019).

7.1.10. Spotted Bottlenose Dolphin (Indo-Pacific bottlenose dolphin)

The spotted bottlenose dolphin (*Tursiops aduncus*) (Arafura/ Timor Sea populations) is generally considered to be a warm water subspecies of the spotted bottlenose dolphin, occurring in shallow (often <10 m deep) inshore waters (Bannister et al., 1996; Hale et al., 2000). The known distribution of the spotted bottlenose dolphin extends from Shark Bay north to the western edge of the Gulf of Carpentaria in Australia (DoEE 2016b).

7.1.11. Australian humpback dolphin

Australian humpback dolphins (*Sousa sahulensis*) are found in tropical/subtropical waters of the Sahul Shelf from northern Australia to the southern waters of the island of New Guinea (Jefferson and Rosenbaum, 2014). In Australia, humpback dolphins are thought to be widely distributed along the northern Australian coastline from approximately the Queensland–New South Wales border to western Shark Bay, Western Australia (Parra & Cagnazzi 2016). Most studies to date indicate that Australian humpback dolphins occur mostly close to the coast (within 20 km from land) and in relatively sheltered offshore waters near reefs or islands (Parra & Cagnazzi 2016). Around the North West Cape, dolphins have been sighted in clear waters over Ningaloo Reef, and in turbid waters in Exmouth Gulf and in depths ranging from 1 to 40 m deep. Australian humpback dolphins do not appear to undergo large-scale seasonal migrations, although seasonal shifts in abundance have been observed.

7.1.12. Irrawaddy Dolphin (Australian Snubfin Dolphin)

The Irrawaddy dolphin, also known as the snubfin dolphin (*Orcaella heinsohni*), is known to occur within the waters off northern Australia, extending north from Broome in Western Australia to the Brisbane River in Queensland (DoEE 2016c). Surveys have indicated that the species is typically found in protected shallow nearshore waters, generally less than 20 m deep, adjacent to river and creek mouths close to seagrass beds (DoEE 2016c). The snubfin dolphin was not recorded during any of the aerial surveys undertaken along the Dampier Peninsula coastline in the vicinity of James Price Point but were observed in Roebuck Bay from vessels on several occasions (RPS, 2010b). Based on the extensive survey effort and amenable conditions within the James Price Point coastal area during the survey, it is concluded that this species is seldom found outside of shallow and sheltered bays and inlets (DSD 2010). The population in Australian waters is thought to be continuous with the Papua New Guinea species but separate from populations in Asia. Breeding is thought to occur throughout the year for this species.

7.1.13. Dugong

The dugong (*Dugong dugon*) is a large herbivorous marine mammal (up to 3 m) that feeds off seagrass and generally inhabits coastal areas. Key populations along the WA coast are principally located at: Shark Bay (the largest resident population in Australia), Ningaloo Marine Park and Exmouth Gulf, the Pilbara coast and offshore areas including Montebello/ Barrow/ Lowendal Islands, and further north at Eighty Mile Beach and off the Kimberley Coast, particularly Roebuck Bay and Dampier Peninsula (Marsh et al. 2002; DSEWPaC 2012). Populations are also present at Ashmore Reef, and the north coast of the Tiwi Islands is recognised as a key site for the conservation of dugongs. A well-known major dugong aggregation of approximately 4,400 individuals occurs in waters seaward (within approximately 50 km) of the Tiwi Islands and ranks in the top eight of dugong populations in the world.

Dugong distribution and movement is based on the abundance, size and species of seagrass meadow. Dugongs can migrate hundreds of kilometres between seagrass habitats. Dugongs have been tracked moving long distances of up to 300 km between the Australia mainland and the Tiwi Islands (Whiting et al., 2009). Satellite-tracking data from dugongs tagged as part of the INPEX Ichthys Project baseline surveys observed that dugongs around the Vernon Islands, south of Melville Island, spent time in Darwin Harbour and around the Tiwi Islands (INPEX, 2010). Routine sightings occur in various locations along the NT coastline, including within Darwin Harbour, to the south of Melville Island.

The dugong BIAs in the EMBA are detailed in **Table 9** and shown in **Figure 11**.

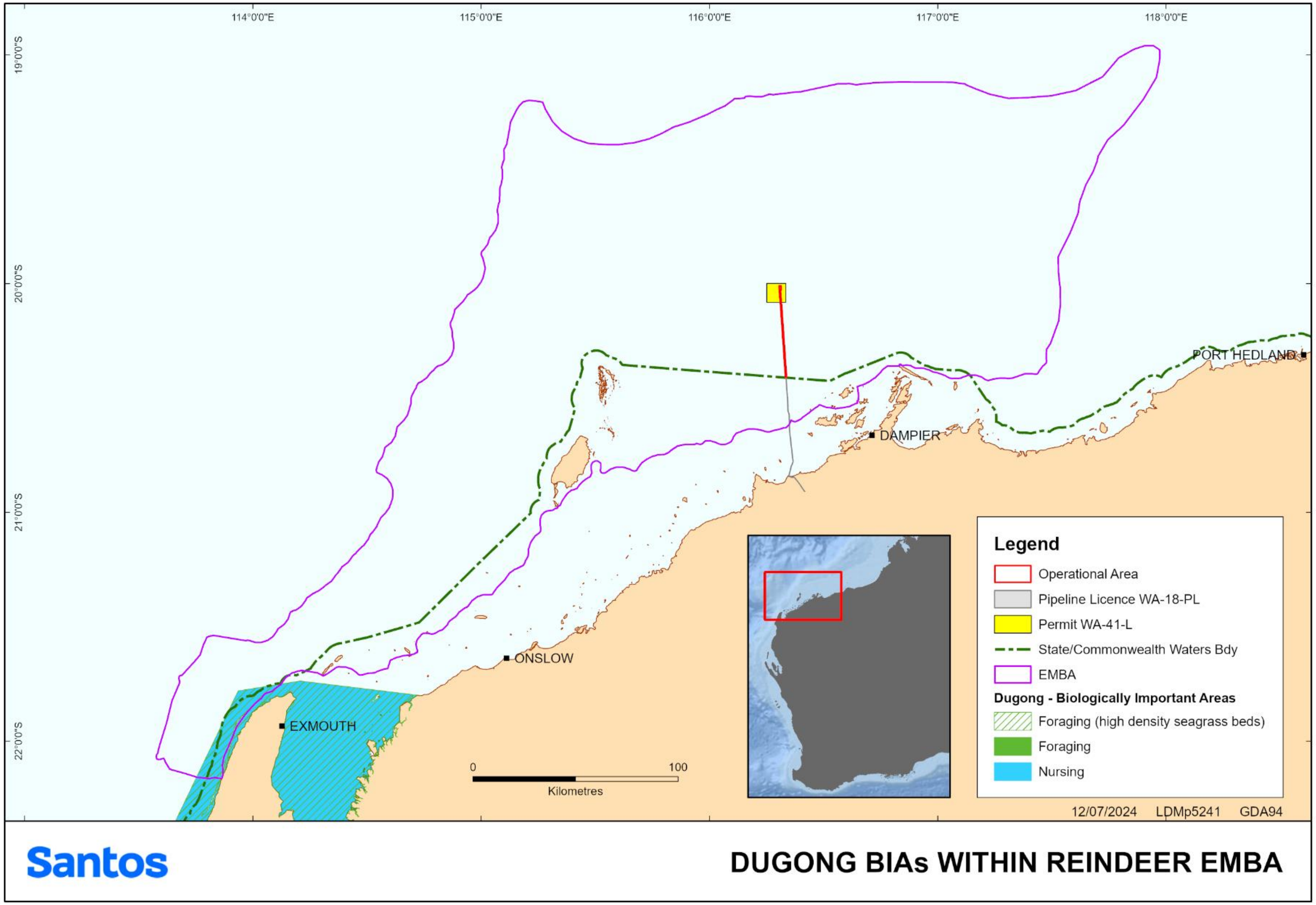


Figure 11: Biologically Important Areas – Dugong

Table 8: Summary of information for marine mammals listed as threatened under the EPBC Act

Aspect	Sei whale	Blue and pygmy blue whales	Fin whale	Southern right whale	Humpback whale
Species expected in area	Unknown	Yes	Unknown	Unlikely, southern distribution	Yes
Migration depth (m)	Unknown, prefers offshore waters	500-1,000	Unknown	n/a	Up to 100
Migration seasonality	Unknown	Apr to Aug (north), Oct to Jan (south)	Unknown	Apr to Oct	Jun to Nov

7.2. Biologically Important Areas / Critical Habitat – Marine Mammals

Table 9 below provides an overview of BIAs in the EMBA for marine mammals.

The DCCEEW may also make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, relevant recovery plans are listed in **Section 13.2**.

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species. To date no critical habitat in WA has been listed under either Act. No provision is made under the TPWC Act for listing critical habitat.

Table 9: Biologically Important Areas – marine mammals

Species	Scientific name	Aggregation area and use	BIAs within EMBA
Pygmy blue whales	*Balaenoptera musculus*	Migration – along the continental shelf edge off the WA coastline, extending offshore near Scott Reef and into Indonesian waters Foraging – along Ningaloo reef, around Scott Reef, around the Perth canyon Distribution – along the WA coastline towards and beyond Indonesia.	Augusta to Derby. Tend to pass along the shelf edge at depths of 500 m to 1000 m; appear close to coast in the Exmouth-Montebello Islands area on southern migration. Ningaloo
Southern right whale	*Eubalaena australis*	Reproduction – along the coastline of Ningalo	Ningaloo
Humpback whale	*Megaptera novaeangliae*	Breeding/calving/nursing/resting – Kimberley/Coastal North Lacepede Island, Campden Sound, Exmouth Gulf, Shark Bay Migration - northern migration deeper waters of the continental shelf, southward migration – along the WA mainland	Exmouth Gulf Kimberley/Coastal North Lacepede Island, Camden Sound The migration corridor extends from the coast to out to approximately 100 km offshore in the Kimberley region extending south to North West Cape. From North West Cape to south of Shark Bay the migration corridor is reduced to approximately 50 km.
Dugong	*Dugong dugon*	Foraging –Dampier Peninsula, Roebuck Bay, Shark Bay, Exmouth and Ningaloo coastline Migration – Roebuck Bay and North East Peron Peninsula, Shark Bay Breeding/calving/nursing – Exmouth and the Ningaloo coastline	Exmouth Gulf

8. Birds

Marine waters and coastal habitats in the EMBA contain key habitats that are important to birds, including offshore islands, sandy beaches, tidal flats, mangroves, and coastal and pelagic waters. These habitats support a variety of birds which utilise the area in different ways and at different times of the year (DSEWPaC 2012a). Birds can be broadly grouped according to their preferred foraging habitat as coastal/ terrestrial birds, seabirds, and shorebirds.

Coastal or terrestrial species inhabit the offshore islands and coastal areas of the mainland throughout the year. These species are either primarily terrestrial, or they may forage in coastal waters.

Seabirds include those species whose primary habitat and food source is derived from pelagic waters. These species spend the majority of their lives at sea, ranging over large distances to forage over the open ocean. Seabirds present in the area include terns, noddies, petrels, shearwaters, tropicbirds, frigatebirds boobies and albatrosses (DEWHA 2008a).

Shorebirds, including waders, inhabit the intertidal zone and adjacent areas. Some shorebird species, including oystercatchers are resident (Surman & Nicholson 2013). Other shorebirds are migratory and include species that utilise the East Asian–Australasian Flyway, a migratory pathway for millions of migratory shorebirds that travel from Northern Hemisphere breeding grounds to Southern Hemisphere resting and foraging areas. Shorebirds that regularly migrate through the area include the Scolopacidae (curlews, sandpipers etc.) and Charadriidae (plovers and lapwings) families.

Surveys in the area by Santos and other agencies have built a picture of diverse avifauna. A summary of research is discussed below, followed by information on threatened and migratory birds.

8.1. Regional Surveys

8.1.1. North West Cape

Avifauna surveys of the North West Cape have recorded 144 bird species, one third of which are seabirds and shorebirds (resident and migratory) (May et al. 1983). Approximately 33 species of seabirds and shorebirds are found in the Ningaloo Marine Park with the main breeding areas at Mangrove Bay, Mangrove Point, Point Maud, the Mildura wreck site and Fraser Island (CALM & MPRA 2005a).

8.1.2. Muiron Islands and Exmouth Gulf Islands

Muiron Islands and Exmouth Gulf Islands are generally lacking in published bird observations data. Early indications from surveys commissioned by Santos in 2013/14 indicate that South and North Muiron Islands are regionally significant in terms of wedge-tailed shearwater (*Ardenna pacifica*) nesting, whilst Bessiers and Fly islands are also significant (Surman pers comm. 2013). Nine coastal/terrestrial species and 21 shorebirds were identified on the Muiron and Exmouth Gulf Islands during the first of these surveys and seven bird species were recorded nesting (Surman 2013).

8.1.3. Dampier Archipelago/Cape Preston Region

The Dampier Archipelago/Cape Preston region is a nesting area for at least 16 species of seabirds. Many of the islands and rocks in the area are known breeding grounds for birds, including wedge-tailed shearwaters (*Ardenna pacifica*), Caspian terns (*Sterna caspia*), bridled terns (*Onychoprion anaethetus*) and roseate terns (*Sterna dougallii*). Small islands and islets such as Goodwyn Island, Keast Island and Nelson Rocks provide important undisturbed nesting and refuge sites, and Keast Island provides one of the few nesting sites for pelicans in WA (CALM & MPRA 2005b).

8.1.4. Barrow Island Group

Barrow Island and surrounding islands have a diverse avifauna comprising at least 119 species (Chevron 2010), including 11 resident land birds, eight resident seabirds, 17 seabirds, 22 species of migratory waders, six resident shorebirds and 43 irregular visitors (Surman 2003). The avifauna of Barrow Island is thus poor in terms of land birds and waterfowl compared to mainland areas of the Pilbara, but rich in migratory waders and seabirds. Compared to other nearby offshore islands, Barrow Island has substantially more migratory waders but fewer breeding seabirds (Surman 2003).

8.1.5. Lowendal Island Group and Airlie and Serrurier Islands

The Lowendal Island Group has a diverse avifauna comprising 89 recorded species (Dinara Pty Ltd. 1991, Burbidge et al. 2000). Six species of resident land birds and six species of raptors have been recorded at the Lowendal Islands (Surman & Nicholson 2012). Up to fourteen seabird species have been observed at any one time during annual surveys of the Lowendal Islands between 2004 and 2012. Surveys at the Montebello Islands have recorded 70 bird species. This includes 12 species of seabirds and 14 species of migratory shorebirds (Burbidge et al. 2000). Wedge-tailed shearwaters have been identified to nest on Varanus, Airlie, Serrurier and Bridled Islands (Astron 2017a). Breeding participation on the islands appears to be largely influenced by pre-breeding oceanographic conditions (Astron 2017a). Monitoring in 2016/17 was undertaken by Santos and demonstrated the colony sizes for wedge-tailed shearwaters to be within or above previously reported ranges (Astron 2017a). This is informed though monitoring that has been undertaken under the Integrated Shearwater Monitoring Program (ISMP), established in 1994.

In 2016/17, areas of potential wedge-tailed shearwater nesting habitat were recorded on Varanus Island (5.53 ha) and Airlie Island (12.47 ha) and surrounding islands of Bridled (2.94 ha), Serrurier (130.89 ha), Abutilon (2.02 ha) and Parakeelya (1.66 ha) (Astron 2017a). The number of wedge-tailed shearwater breeding pairs was also estimated for each of Varanus (1,492 +/- 702), Airlie (600 +/- 124), Bridled (1,039 +/- 342), Serrurier (23,240 +/- 4,341), Abutilon (317 +/- 210) and Parakeelya (172 +/- 138) islands (Astron 2017a).

Other seabird species utilising Abutilon, Beacon, Bridled and Parakeelya islands for nesting include bridled terns, silver gulls and crested terns. Monitoring for these seabirds in 2016/17 was also completed by Santos, with monitoring results concluded to support previous trends for all species. Bridled terns mainly utilise Abutilon, Bridled and Parakeelya islands for breeding, with smaller numbers noted on Beacon and Varanus Islands. The bridled terns have not been recorded on Airlie Island and only in very small numbers on Varanus Island (Astron 2017b).

Silver gull numbers appear to be growing across the region (2010/2011). However, reasons for this are unknown but considered possibly to be due to greater prey availability or immigration from the mainland (Astron 2017b). Silver gulls have been found to utilise Bridled, Parakeelya, Abutilon and Beacon islands longer term for breeding. Silver gulls have not been identified to nest on Varanus island and were only recorded nesting on Airlie island for the first time in 2016/17 since monitoring commencement in 2004/05 (Astron 2017b).

The crested tern is noted as nomadic breeders that appear to use a consistent subset of islands for breeding. In 2016/17, Beacon Island was the favourable nesting site for the crested tern (Astron 2017b). Surveys in the vicinity of Port Hedland (Bennelongia 2011) recorded 23 species of migratory shorebird between 2002 and 2011. Terrestrial/coastal and seabird species were not targeted. A total of 4,248 migratory shorebirds of 18 species were observed during the field survey in April 2011.

8.2. Threatened Species

A Protected Matters search of the EMBA identified 19 bird species (Appendix D of the Reindeer EP, Document No.7715-650-EMP-0023) listed as threatened under the EPBC Act.

An examination of the Species Profile and Threats database (DAWE 2020a) and The Action Plan for Australian Birds (Garnet 2011) showed that some listed bird species are not expected to occur in significant numbers in the marine and coastal environments in the EMBA due to their terrestrial. Hence, these species are not discussed further.

EPBC Act threatened species expected to occur in the area are listed in **Table 10** along with their WA conservation status (as applicable) and discussed below. There are an additional 25 migratory species listed under the EPBC Act in the EMBA, with these detailed in **Section 8.3** (**Table 12**). BIAs for birds are detailed in **Table 16** and depicted in **Figure 12.**

Table 10: Birds listed as threatened under the EPBC Act

Species	Conservation Status				Likelihood of occurrence in EMBA	BIAs in EMBA
	EPBC Act 1999	BC Act 2016	Other WA Conservation Code	TPWC Act 1976		
Shorebirds						
Red knot[8] (*Calidris canutus*)	Endangered, Migratory	Endangered	-	Endangered	Species or species habitat known to occur within area	None - No BIA defined
Curlew sandpiper[8] (*Calidris ferruginea*)	Critically endangered, Migratory	Critically endangered	-	Critically endangered	Species or species habitat known to occur within area	None - No BIA defined
Greater sand plover (*Charadrius leschenaultii)*	Vulnerable, Migratory	Vulnerable	-	Vulnerable	Species or species habitat known to occur within area	None - No BIA defined
Northern Siberian bar-tailed godwit (*Limosa lapponica menzbieri)*	Critically endangered, Migratory[6]	Critically endangered, Specially protected (migratory)[6]	-	Critically endangered	Species or species habitat known to occur within area	None - No BIA defined
Eastern curlew[8] (*Numenius madagascariensis)*	Critically endangered, Migratory	Critically endangered	-	Critically endangered	Species or species habitat known to occur within area	None - No BIA defined
Australian painted snipe (*Rostratula australis)*	Endangered	Endangered	-	Endangered	Species or species habitat known to occur within area	None - No BIA defined
Sharp-tailed sandpiper[8] (*Calidris acuminata*)	Vulnerable, Migratory	-	-	-	Species or species habitat known to occur within area	None - No BIA defined
Asian dowitcher[8] *(Limnodromus semipalmatus)*	Vulnerable, Migratory	-	-	-	Species or species habitat known to occur within area	None - No BIA defined
Common greenshank[8] (*Tringa nebularia*)	Endangered, Migratory	-	-	-	Species or species habitat likely to occur within area	None - No BIA defined
White-winged fairy-wren (Barrow Island), Barrow Island black-and-white fairy-wren (Malurus leucopterus edouardi)	Vulnerable	-	-	-	Species or species habitat likely to occur within area	None - No BIA defined
Red goshawk *(Erythrotriorchis radiatus)*	Endangered	-	-	-	Species or species habitat may occur within area	None - No BIA defined
Seabirds						
Southern giant petrel (*Macronectes giganteus)*	Endangered, Migratory	Specially protected (migratory)	-	-	Species or species habitat may occur within area	None - BIA not found in EMBA
Australian fairy tern (*Sternula nereis nereis)*	Vulnerable	Vulnerable	-		Breeding known to occur within area	Yes – refer to **Table 16**
Soft-plumaged petrel (*Pterodroma mollis)*	Vulnerable	-	-	-	Foraging, feeding or related behaviour	None - BIA not found in EMBA

Species	**Conservation Status**				**Likelihood of occurrence in EMBA**	**BIAs in EMBA**
	EPBC Act 1999	**BC Act 2016**	**Other WA Conservation Code**	**TPWC Act 1976**		
					known to occur within area (high numbers)	
Indian yellow-nosed albatross (*Thalassarche carteri)*	Vulnerable, Migratory	Endangered	-	-	Species or species habitat likely to occur in area	None - BIA not found in EMBA
Campbell albatross (*Thalassarche impavida)*	Vulnerable, Migratory	Vulnerable	-	-	Species or species habitat may occur within area	None - BIA not found in EMBA
Christmas Island white-tailed tropicbird (*Phaethon lepturus fulvus)*	Endangered	-	-	-	Species or species habitat known to occur within area	None - No BIA defined
Red-tailed tropicbird *(Phaethon rubricauda westralis)*	Endangered	-	-	-	Species or species habitat likely to occur within area	None - No BIA defined

8.2.1. Shorebirds

Red Knot

The red knot (*Calidris canutus*) is listed as Vulnerble and Migratory under the EPBC Act. It is a migratory shorebird, and the species includes five subspecies, including two found in Australia, *Calidris canutus piersmai* and *Calidris canutus rogersi*. The red knot breeds in Siberia and spends the non-breeding season in Australia and New Zealand. During the non-breeding season, the species spends the majority of its time on tidal mudflats or sandflats where they feed on intertidal invertebrates, especially shellfish (Garnet et al. 2011).

Curlew Sandpiper

This species (*Calidris ferruginea*) is listed as Critically Endangered and Migratory under the EPBC Act. It is a shorebird that breeds in north Siberia and spends the non-breeding season from western Africa to Australia (Bamford et al. 2008). The curlew sandpiper occurs around coastal Australia and preferred habitats include coastal brackish lagoons, tidal mud and sand flats, estuaries, saltmarshes and less often inland. Their diet is mainly comprised of polychaete worms, molluscs and crustaceans (Higgins & Davies 1996 in Garnet et al. 2011).

Greater Sand Plover

The greater sand plover (*Charadrius leschenaultii*) is listed as Vulnerable and Migratory under the EPBC ACT and breeds in China, Mongolia and Russia. The greater sand plover spends the non-breeding season along coasts from Japan through southeast Asia to Australasia, while the lesser sand plover spends the non-breeding season along coasts from Taiwan to Australasia (Bamford et al. 2008). Non-breeding birds occur along all Australian coasts, especially in the north for the greater sand plover and in the east for the lesser sand plover (DAWE 2020a).

Non-breeding birds forage on beaches, saltmarshes, coastal bays and estuaries, and feed on marine invertebrates including molluscs, worms, crustaceans and insects (Marchant & Higgins 1993 in Garnet et al. 2011).

Bar-tailed Godwit (Northern Siberian Subspecies)

Two subspecies of the bar-tailed godwit exist, as determined by their breeding locations in Siberia and Alaska (Bamford et al. 2008). Non-breeding birds migrate to the coasts of Australia. The northern Siberian subspecies (*c*occurs along the coasts of north Western Australia (DAWE 2020a) and is located within the EMBA. It is listed as Endangered under the EPBC Act.

Non-breeding birds are found on muddy coastlines, estuaries, inlets, mangrove-fringed lagoons and sheltered bays, feeding on annelids, bivalves and crustaceans (Higgins and Davies 1996 in Garnet et al. 2011).

Eastern Curlew

The eastern curlew (*Numenius madagascariensis*) listed as Critically Endangered and Migratory under the EPBC Act. It is a migratory shorebird that breeds in Siberia, Kamchatka and Mongolia and migrates to coastal East Asia and Australia. The South Korean Yellow Sea is an important staging post for this species. Non-breeding birds occur around coastal Australia, are more common in the north and have disappeared or become much rarer at many sites along the south coast (Garnet 2011).

Non-breeding birds are present at estuaries, mangroves, saltmarshes and intertidal flats, particularly those with extensive seagrass (Zosteraceae), where they feed on marine invertebrates, especially crabs and small molluscs (Higgins & Davies 1996 in Garnet 2011).

Australian Painted Snipe

The Australian painted snipe (*Rostratula australis*) is listed as Endangered under the EPBC Act.). This species is generally seen singly or in pairs, or less often in small flocks (Marchant & Higgins 1993). The Australian painted snipe has been recorded at wetlands in all states of Australia (Barrett et al. 2003; Blakers et al. 1984; Hall 1910b), although in South Australia, the Northern Territory and Western Australia it has been recorded at a small number (Barrett et al. 2003; Blakers et al. 1984; Marchant & Higgins 1993; Rogers et al. 2005). The Australian painted snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Breeding may be in response to wetland conditions rather than during a particular season as it has been recorded breeding in all months in Australia (Marchant & Higgins 1993).

Sharp-tailed sandpiper

The sharp-tailed sandpiper (*Calidris acuminata*) is listed as Vulnerable under the EPBC Act. The sharp-tailed sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats (Cramp 1985; Higgins & Davies 1996). In Western Australia (WA), scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division (Higgins & Davies 1996). They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water and they are recorded to eat various insects, worms, molluscs, crustaceans and plant seed (Higgins & Davies 1996).

Asian dowitcher

The Asian dowitcher (*Limnodromus semipalmatus)* is listed as Vulnerable and Migratory under the EPBC Act. The Asian Dowitcher was first recorded in Australia in 1972 and is a regular visitor to the north-west between Port Hedland and Broome. In Western Australia the species has been recorded at Albany, Lake McLarty, Lake McLeod, north-east Pilbara and the south-west Kimberley division. It has also been recorded at the Port Hedland Saltworks, Roebuck Bay, Ashmore Reed and Eighty Mile Beach (Higgins & Davies 1996). It is known to eat polychaete worms and larvae, also insect larvae and molluscs. The Asian Dowitcher occurs in sheltered coastal environments, such as embayments, coastal lagoons, estuaries and tidal creeks. They are known to frequent shallow water and exposed mudflats or sandflats where they feed (Higgins & Davies 1996).

Common greenshank

The common greenshank (*Tringa nebularia*) is listed as endangered and Migratory under the EPBC Act. The Common Greenshank is a migratory species, heavily built, elegant wader.. The species is seen singly or in small to large flocks (sometimes hundreds) in a variety of coastal and inland wetlands (Higgins & Davies 1996). This species does not breed in Australia, however, it occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies 1996). It is generally absent from the Western Deserts although there are a few records from the Great Sandy Desert and the Nullarbor Plain. It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago (Higgins & Davies 1996). The Common Greenshank is carnivorous and it feeds during both day and night time. In Australia is has been recorded eating molluscs, crustaceans, insects, and occasionally fish and frogs. The birds wade in shallow water along edge of water in tidal estuaries, muddy claypans, saltworks and saltpans (Higgins & Davies 1996).

White-winged fairy-wren (Barrow Island), Barrow Island black-and-white fairy-wren

The white-winged fairy wren (*Malurus leucopterus edouardi*) is listed as Vulnerable under the EPBC Act. It is usually observed in small groups of three to eight birds, but it can also occur singly or in twos (Bamford & Wilcox 2005; Pruett-Jones & Tarvin 2001; Sedgwick 1978; Serventy & Marshall 1964). The White-winged Fairy-wren (Barrow Island) is endemic to Australia, and it is only found on Barrow Island (Garnett & Crowley 2000; Schodde & Mason 1999), which lies off the coast of Western Australia. As the entire population of this species (estimated, most recently, at 9 336 birds) occurs on Barrow Island (area of approximately 250 km^2) (Bamford & Wilcox 2005; Garnett & Crowley 2000; Pruett-Jones & O'Donnell 2004; Schodde & Mason 1999) it is presumed that the distribution of the White-winged Fairy-wren (Barrow Island) is not fragmented. The White-winged Fairy-wren (Barrow Island) has been recorded breeding from April to October, with most eggs laid from June to August (Ambrose & Murphy 1994; Butler 1970; Johnstone & Storr 2004; Pruett-Jones & O'Donnell 2004; Schodde 1982; Sedgwick 1978; Serventy & Marshall 1964; Whitlock 1919).

Red goshawk

The red goshawk (*Erythrotriorchis radiatus*) is listed as Endangered under the EPBC Act. They are solitary and very thinly dispersed. It is usually observed singly, and occasionally in pairs or family groups. Red goshawk pairs are believed to remain within the nesting territory all year, but some may expand their home range when not breeding (Aumann & Baker-Gabb 1991; Debus & Czechura 1988b). The species is endemic to Australia, and it is very sparsely dispersed across approximately 15% of coastal and sub-coastal Australia, from western Kimberley Division (north of 19°S) to northeastern NSW (north of 33°), and occasionally on continental islands (Aumann & Baker-Gabb 1991; Marchant & Higgins 1993).

8.2.2. Seabirds

Indian yellow-nosed albatross

The Indian yellow-nosed albatross (*Thalassarche carteri*) is listed as Vulnerable and Migratory under the EPBC Act. It forages mostly in the southern Indian Ocean where it is particularly abundant off Western Australia (Marchant & Higgins 1990). The Indian Yellow-nosed Albatross breeds on islands of the southern Indian Ocean. The National Conservation Values Atlas (DAWE 2020b) and the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011) do not identify any BIAs for these species in the area from Busselton to the NT border. In waters off southern Western Australia and South Australia the species is most abundant between March and May.

Campbell albatross

The Campbell albatross (*Macronectes giganteus*) is listed as Vulnerable and Migratory under the EPBC Act. The Campbell Albatross is a non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen foraging over the oceanic continental slopes off Tasmania, Victoria and New South Wales (EA 2001). After breeding, birds move north and may enter Australia's temperate shelf waters (Marchant & Higgins 1990). The Campbell Albatross is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats (Marchant & Higgins 1990).

Southern Giant Petrel

The southern giant petrel (*Macronectes giganteus*) is listed as Endangered and Migratory under the EPBC Act. It is highly migratory with a large natural range. This species occurs from Antarctic to subtropical waters and breeds on the Antarctic continent, peninsular and islands and on subantarctic islands and South America. Breeding occurs annually between August and March (DAWE 2020a).

The National Conservation Values Atlas (DAWE 2020b) and the National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011-2016 (DSEWPaC 2011) do not identify any BIAs for this species in the area from Busselton to the NT border.

Australian Fairy Tern

The Australian fairy tern (*Sternula nereis nereis*) is listed as Vulnerable under the EPBC Act. It is distributed in a large geographic range between Australia, New Zealand and New Caledonia. Three subspecies have been identified, one of which is found in Australia. The Australian fairy tern occurs along the coasts of Victoria, Tasmania, South Australia and WA; occurring as far north as the Dampier Archipelago (DAWE 2020a). The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine islands, wetlands and mainland coastline (Higgins & Davies 1996 in DoE 2014b, Lindsey 1986).

Australian fairy terns nest on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The Australian fairy tern breeds from August to February depending on the location of the breeding colony (Higgins & Davies 1996 in DAWE 2020a). They generally nest in small colonies of up to 100 birds, although larger colonies of more than 1400 pairs have been reported in Western Australia (Hill et al. 1988).

The National Conservation Values Atlas (DAWE 2020b) identifies the vicinity of the lower north-west coast (north to Dampier Archipelago) and west coast (south to Peel inlet) as BIAs for foraging. Biologically important breeding areas were also identified scattered along the coast between Shark Bay and the Pilbara (**Table 16**).

Soft-Plumaged Petrel

The soft-plumaged petrel (*Pterodroma mollis*) is listed as Vulnerable and generally found over temperate and subantarctic waters in the South Atlantic, Southern Indian and western South Pacific Oceans. The species breeds colonially on islands in the southern oceans. Breeding occurs from August to May (Marchant & Higgins 1990 in DAWE 2020a).

A BIA for this species is identified for foraging in seas north to 21°30'S off WA.

Christmas Island White-tailed Tropicbird

The Christmas Island white-tailed tropicbird (*Phaethon lepturus fulvus)* is listed as Endangered and is endemic to Christmas Island and leaves the island to forage in the warm waters of the Indian Ocean (Garnett 2011). The white-tailed tropicbird roosts and forages at sea; only incubating or brooding adults remain on nests on the island at night (Stokes 1988).

The National Conservation Values Atlas (DAWE 2020b) does not identify any BIAs for this species within the EMBA.

Red-tailed Tropicbird

The red-tailed tropicbird (*Phaethon rubricauda westralis*) is listed as Endangered under the EPBC Act. It is a pelagic species, and it can be found in tropical and subtropic parts of the Indian Ocean (Marchant & Higgins 1990). Birds prefer regions with water salinities of less than 35%, and surface temperature of 24 to 30 °C (Pocklington 1979; Dunlop et al. 1988, 2001). They feed on fish and cephalopods, foraging by plunging into the water, or capturing flying fish in flight (Gibson-Hill 1947; Gould et al. 1974). The subspecies nests alone, or in loose colonies on islands, stacks, atolls, cays or coastal cliffs (Marchant & Higgins 1990). The Indian Ocean red-tailed tropicbird has a restricted area of occupancy (AOO) of 94 km2 (Willacy et al. 2021), as the subspecies only breeds on a small number of islands: Christmas Island (James & McAllan 2014), Cocos (Keeling) Islands (Stokes et al. 1984), Bedwell Island, Rowley Shoals (Berry 1986), Islands of Ashmore Reef (Clarke et al. 2011) and Rottnest Island (Mather & Greenwell 2021; Mather 2022). All known and potential breeding habitat and islands should be considered habitat critical to the survival of the subspecies (DCCEEW, 2023).

Santos

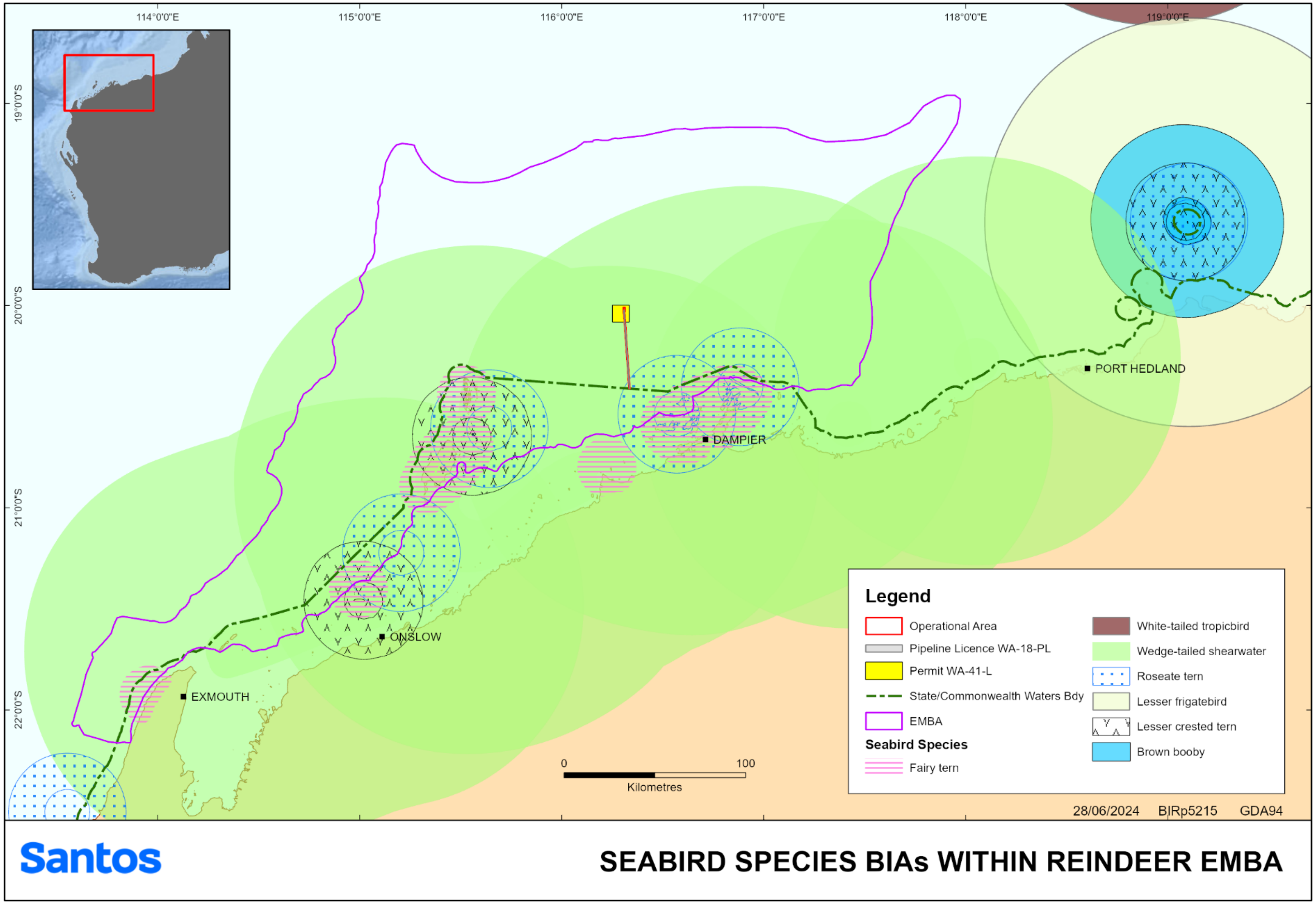


Figure 12: Biologically Important Areas – Seabirds – Northern WA

Table 11: Summary of information for birds listed as threatened under the EPBC Act that may be in the EMBA

Species	Species Expected in EMBA	Breeding in the Area/ Seasonality	Foraging
Shorebirds			
Red knot[8]	Yes	No	Intertidal invertebrates
Curlew sandpiper[8]	Yes	No	Polychaete worms, molluscs and crustaceans taken from shorelines
Greater sand plover[8]	Yes	No	Marine invertebrates taken from shorelines
Northern Siberian bar-tailed godwit[8]	Yes	No	Worms, molluscs, crustaceans, insects and some plant material
Eastern curlew[8]	Yes	No	Marine invertebrates associated with seagrass
Australian painted snipe	Yes	No	Seeds and small invertebrates around wetlands and swamps.
Sharp-tailed sandpiper[8]	Yes	No	Seeds, worms molluscs, crustaceans, insects, and occasionally fish and frogs.
Asian dowitcher[8]	Yes	No	Polychaete worms and larvae, also insect larvae and molluscs from mudflats
Common greenshank[8]	Yes	No	Molluscs, crustaceans, insects, and occasionally fish and frogs around wetlands
White-winged Fairy Wren (Barrow Island)	Yes	Yes Apr to Oct	Mainly insects, supplementing with small fruits and leaf buds on Barrow Island
Red goshawk	Low densities	Yes May to Oct	Live prey including birds (95%), mammals, reptiles and insects.
Seabirds			
Indian yellow-nosed albatross	Low densities	No	Cephalopods, and fish taken from marine and coastal waters.
Campbell albatross	Low densities	No	Cephalopods, fish, salps, jellyfish and crustaceans taken from marine and coastal waters.
Southern giant petrel	Low densities	No	Scavenges penguin, seal and whale carcasses. Hunts live birds, penguin chicks' cephalopods and krill. Marine and coastal waters (DoE 2014b)
Australian fairy tern	Yes	Yes Aug to Feb	Bait fish taken from coastal waters.
Soft-plumaged petrel	Low densities	No	Cephalopods, fish and crustaceans taken from marine and coastal waters (DoE 2014b)
Christmas Island white-tailed tropicbird	Very low densities	No	Squid and flying fish.
Red-tailed tropicbird	Low densities	Yes	Fish (including flying fish) and cephalopods.

[8] Species listed under the East Asian-Australasian Flyway Partnership

8.3. Migratory Species

The EPBC PMST search identified an additional 20 species listed as migratory under the EPBC Act that may occur within the EMBA. These species are listed in **Table 12**. All of these species are also listed as migratory under the BC Act, with the exception of the red-tailed tropicbird which is listed as migratory under the EPBC Act and migratory and a Priority 4 under the BC Act.

Those species that are listed as both migratory and threatened under either the EPBC Act and/or BC Act are outlined in **Table 10** and are not repeated within **Table 12**.

Table 12: Summary of migratory birds that may occur within the EMBA

Species	Common Name	Likelihood of occurrence in EMBA
Limosa lapponica[8]	Bar-tailed godwit	Species or species habitat known to occur within area
Onychoprion anaethetus	Bridled tern	Breeding known to occur within area
Hydroprogne caspia	Caspian tern	Breeding known to occur within area
Anous stolidus	Common noddy	Species or species habitat likely to occur within area
Actitis hypoleucos[8]	Common sandpiper	Species or species habitat known to occur within area
Ardenna carneipes	Flesh-footed shearwater	Species or species habitat likely to occur within area
Apus pacificus	Fork-tailed swift	Species or species habitat likely to occur within area
Thalasseus bergii	Greater crested tern	Breeding known to occur within area
Fregata minor	Greater frigatebird	Species or species habitat may occur within area
Thalasseus bengalensis	Lesser crested tern	Not listed in PMST search; however, breeding BIA does overlap the EMBA and therefore this species is assumed to be within the EMBA
Fregata ariel	Lesser frigatebird	Species or species habitat known to occur within area
Sternula albifrons	Little tern	Species or species habitat may occur within area
Charadrius veredus[8]	Oriental plover	Species or species habitat may occur within area
Glareola maldivarum[8]	Oriental pratincole	Species or species habitat may occur within area
Pandion haliaetus	Osprey	Breeding known to occur within area
Calidris melanotos[8]	Pectoral sandpiper	Species or species habitat may occur within area
Sterna dougallii	Roseate tern	Breeding known to occur within area
Calonectris leucomelas	Streaked shearwater	Species or species habitat likely to occur within area
Ardenna pacifica	Wedge-tailed shearwater	Breeding known to occur within area
Phaethon lepturus	White-tailed tropicbird	Species or species habitat known to occur within area

[8] Listed under the East Asian- Australasian Flyway Partnership

Australia is signatory to three international treaties with China, Japan and the Republic of Korea to safeguard migratory bird species, predominantly shorebirds. To facilitate observance of the three agreements, 36 species of migratory shorebirds have been listed as specially protected under both the Commonwealth EPBC Act and the WA BC Act.

The EPBC Act Policy Statement 3.21 sets out criteria for determining the significance of sites to migratory shorebirds based on the number of migratory species and the proportion of a species population that is supported by the site (Commonwealth of Australia 2017b). Site significance can be difficult to assess, particularly for ephemeral inland wetlands. These areas may be used rarely, depending on weather conditions, but still provide important habitat for migratory shorebird species.

Migratory shorebirds require a particular conservation approach due to their migration patterns that take them across international boundaries (Bamford et al. 2008). These species and their habitats are sensitive to threats due to their high site fidelity, tendency to aggregate, high energy demands and the need for habitat networks containing both roosting and foraging sites (Commonwealth of Australia 2017b). Migratory shorebirds are known to use networks of connected sites (also known as site complexes). They move within these networks depending on the time of day, availability of resources and environmental conditions at the site (Commonwealth of Australia 2017b).

The types of habitat used by migratory shorebirds in Australia vary across the species identified in the PMST search. Migratory shorebirds use both coastal and inland habitats that most commonly include:

- Coastal habitats: coastal wetlands, estuaries, mudflats, rocky inlets, reefs and sandy beaches, sometimes supporting mangroves.
- Inland habitats: inland wetlands, floodplains and grassland areas, often with ephemeral water sources (Commonwealth of Australia 2017b).

Feeding guilds provide an explanation for much of the shorebird distribution pattern in the north Western Australia. For example, Rogers (1999) classified shorebirds (and others) in Roebuck Bay as belonging to seven guilds on the basis of prey choice and foraging method. In order of abundance, these are summarised in **Table 13**.

Table 13: Feeding guilds based on prey choice and foraging method (Rogers 1999) adapted from DEC (2003) and Bennelongia (2008)

Feeding habitat	Feeding guild	Species
Sea edge	Tactile hunters of macrobenthos	Red knot, bar-tailed godwit, black-tailed godwit, Asian dowitcher
Along sandy sea edges or near tidal creeks	Tactile hunters of microbenthos	Curlew sandpiper, sharp-tailed sandpiper
Reefs or mangrove fringes	Visual hunters of slow surface-dwelling prey	Common sandpiper

The Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015) provides a framework to guide the conservation of migratory shorebirds and their habitat in Australia and, in recognition of their migratory habits, outlines national activities to support their appreciation and conservation throughout the East Asian-Australasian Flyway.

The following migratory shorebird species are subject to the Wildlife Conservation Plan for Migratory Shorebirds 2015 (DoE 2015).

Table 14: Birds subject to the Wildlife Conservation Plan for Migratory Shorebirds 2015

Migratory species	DCCEEW SPRAT information on distribution within the area of interest
Asian dowitcher[8]	The Asian dowitcher is a regular visitor to the north-west between Port Hedland and Broome. Elsewhere they are sporadic and rare.. In WA, the species has been recorded at Albany, Lake McLarty, Lake McLeod, north-east Pilbara and the south-west Kimberley division. It has also been recorded at the Port Hedland Saltworks, Roebuck Bay, Ashmore Reed and Eighty Mile Beach. The Australian population is approximately 500 (Bamford et al. 2008).
Bar-tailed godwit[8]	The bar-tailed godwit has been recorded in the coastal areas of all Australian states. In WA, it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley. Sites of international importance from WA include: • Eighty Mile Beach, WA (110,290 individuals) • Roebuck Bay, WA (65,000 individuals)
Common greenshank[8]	The common greenshank occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberley region, it is recorded in the south-west and the north-east, with isolated records from the Bonaparte Archipelago. WA has three sites of international importance for the common greenshank which include: • Eighty Mile Beach (2,240 individuals) • Wilson Inlet (568 individuals) • Roebuck Bay (560 individuals).
Common sandpiper[8]	WA distribution includes: • Roebuck Bay • Nuytsland Nature Reserve • NT distribution includes: • Kakadu National Park • Darwin area.
Greater sand plover[8]	In Australia, the greater sand plover occurs in coastal areas in all states, though the greatest numbers occur in northern Australia, especially the north-west. In northern Australia, the species is especially widespread between North West Cape and Roebuck Bay in Western Australia and are sparsely scattered records from the largely inaccessible area between Roebuck Bay and Darwin. Internationally important sites within Western Australia include: • Eighty Mile Beach (64,548 individuals) • Roebuck Bay (26,900 individuals) • Ashmore Reef (1,196 individuals).
Oriental plover[8]	Internationally important marine sites: • Eighty Mile Beach, WA (approximately 57 619 individuals) • Roebuck Bay, WA (Approximately 8 750 individuals).
Oriental pratincole[8]	Internationally important site: • Eighty Mile Beach, WA (2.88 million birds). The species occurs at numerous and widespread sites in northern Australia, especially near the Pilbara and Kimberley coasts of northern WA, and throughout the entire coastline of the NT.
Pectoral sandpiper[8]	In Australasia, the pectoral sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire.
Red knot[8]	The red knot large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The Australian population during the non-breeding period is estimated to be 135 000 (Hansen et al. 2016).
Sharp-tailed sandpiper[8]	They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division (Higgins & Davies 1996). Internationally important sites include: • Eighty Mile Beach (25 000 individuals) • Port Hedland Saltworks (20 000 individuals) • Lake Gregory (10 000 individuals) • Peel-Harvey system (4 030 individuals).

[8] Listed under the East Asian-Australasian Flyway Partnership (EAAFP)
NB Fork tailed swift and Streaked shearwater were not on the list of migratory bird subject to the Wildlife Conservation Plan for Migratory birds 2015 so were removed in Rev11 2023
Latham's Snipe was not included in this list as it does not occur within the EMBA

Shorebird migration patterns are seasonal and vary according to species (DSEWPaC 2012a). Generally, shorebirds migrate to northern Australia in August to November. Many birds remain in northern Australia but others disperse southwards (Bennelongia 2011). Migratory shorebird numbers on northern beaches peak in November then again in March as the majority of birds begin their return to the northern hemisphere between March and May. Most migratory shorebirds do not breed in Australia and juvenile birds may spend several years in Australia before reaching maturity and returning north to breed (DEWHA 2009).

The Wildlife Conservation Plan for Migratory Seabirds (DoE 2020) seeks to facilitate a nationally coordinated effort to protect and conserve EPBC Act listed seabirds and provides an over-arching framework for their research and management, while encouraging an effort to address threats to seabirds and their habitats.

The following seabird species found within the EMBA are subject to the Wildlife Conservation Plan for Migratory Shorebirds 2020 (DoE 2020).

Table 15: Birds (migratory) subject to the Wildlife Conservation Plan for Seabirds 2020

Migratory species	DCCEEW SPRAT information on distribution within the area of interest
Red-tailed tropicbird	The Australian population is poorly known owing to the numerous breeding sites and protracted and asynchronous breeding season making an accurate census difficult. The largest population breeds on Christmas Island (>2,000 pairs) with additional key breeding locations on Cocos (Keeling) Group, islands of Ashmore Reef Marine Park, Lord Howe Island, Norfolk Island, Coral Sea Marine Park and two known islands and cays in the Great Barrier Reef Marine Park.
White-tailed tropicbird	In Australia, the white-tailed tropicbird (Indian Ocean) breeds in the Cocos-Keeling Islands, at Ashmore Reef and Rowley Shoals off the northern coast of Western Australia. Over the past few years, birds have been sighted with increased frequency on West Island and Home Island (also in the main atoll) in the Cocos-Keeling Islands. The White-tailed Tropicbird (Indian Ocean) ranges widely over the oceans surrounding its breeding locations (Marchant & Higgins 1990). The breeding population of the white-tailed tropicbird (Indian Ocean) in Australia is estimated at 120 birds.
Wedge-tailed shearwater	The wedge-tailed shearwater breeds on the east and west coasts of Australia and on off-shore islands. The species is common in the Indian Ocean, the Coral Sea and the Tasman Sea (Lindsey 1986). In Western Australia breeding occurs on islands off the west coast of WA including the Cocos-Keeling Island. At WA breeding sites there are at least one million breeding pairs.
Flesh-footed shearwater	The flesh-footed shearwater is a locally common visitor to waters of the continental shelf and continental slope off south-western Western Australia to south-eastern Queensland and around Lord Howe Island. Pairs breed on 41 islands off the coast of south-western Western Australia and Lord Howe Island in south-western Western Australia. Flesh-footed Shearwaters have been recorded as vagrants at Norfolk Island and are possibly regular visitors to Norfolk from breeding colonies on Lord Howe Island and around New Zealand (Moore 1985).
Streaked shearwater	The streaked shearwater undergoes trans-equatorial migration traveling south during winter, to the coasts of Vietnam, New Guinea, the Philippines, Australia, southern India and Sri Lanka. The global population has been estimated to number 3 million individuals.
Lesser frigatebird	It has been suggested that lesser frigatebird roost at Weipa and survey data suggests Ashmore Reef Marine Park comprises significant numbers and is believed to account for ≥1% of the global population.
Common noddy	In Australia, the common noddy occurs mainly in ocean off the Queensland coast, but the species also occurs off the north-west and central Western Australia coast. The species is also rarely encountered off the coast of the Northern Territory, where only one breeding location with about 100-130 birds is known. In 1996, the total Australian population of the Common Noddy was estimated to be between 174 480 and 214 130 breeding pairs.
Little tern	The Australian breeding population can be divided into two major subpopulations (northern and eastern) with the northern subpopulation that breeds across northern Australia, from about Broome in north-western Western Australia through coastal Northern Territory to the Gulf of Carpentaria and eastern Cape York Peninsula.
Caspian tern	Within Western Australia, the Caspian tern is widespread in coastal regions, from the Great Australian Bight to the Dampier Peninsula. There are sparse records on the coasts east of King Sound and in eastern regions. Breeding occurs from the Recherche Archipelago to Dirk Hartog Island and Faure Island in Shark Bay, and also in the Pilbara region from around Point Cloates to North Turtle Island, and more rarely, in the Kimberley.
Roseate tern	In Western Australia, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach, in the Pilbara Region. Around the Kimberley coastline, the subspecies occurs at scattered sites,

Migratory species	DCCEEW SPRAT information on distribution within the area of interest
	north to the Bonaparte Archipelago and possibly further. Records in south-west Western Australia indicate that the subspecies used to be a sporadic visitor to the region, but occurs regularly at present. In addition, breeding colonies have been established on Lancelin Island and Second Rock, off Western Australia (Higgins & Davies 1996). In the Northern Territory, the subspecies has a scattered occurrence along the north coast, mainly from Darwin to Gove Peninsula, though birds have been recorded west to North Peron Island and east to the Sir Edward Pellow Islands (Chatto 2001). The subspecies is more widespread in the west and south-west of the Gulf of Carpentaria (Higgins & Davies 1996).I
Osprey	The breeding range of the eastern osprey around the northern coast of Australia (including many offshore islands) extends from Albany in Western Australia to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia. The species is most abundant in northern Australia, where high population densities occur in remote areas. A population on Barrow Island was estimated at 20 pairs in 1978.

Like many birds, seabirds often migrate after the breeding season. Of these, the migration taken by the Arctic tern (*Sterna paradisaea*) is the farthest of any bird, crossing the equator in order to spend the Austral summer in Antarctica (Egevang et al. 2010; Fijn et al. 2013). Other species also undertake trans-equatorial trips, both from the north to the south, and from south to north (DoE 2020).

Other species migrate shorter distances away from the breeding sites, their distribution at sea determined by the availability of food. If oceanic conditions are unsuitable, seabirds will immigrate to more productive areas, sometimes permanently if the bird is young (Oro et al. 2004). After fledging, juvenile birds often disperse further than adults, and to different areas, so are commonly sighted far from a species' normal range. Some species, such as some of the storm petrels, diving petrels and cormorants, rarely disperse at all, staying near their breeding colonies year-round (DoE 2020).

8.4. Biologically Important Areas / Critical Habitat– Birds

Table 16 below provides an overview of BIAs in the EMBA for birds. The DCCEEW may make recovery plans for threated fauna listed under the EPBC Act. The EPBC Act requires that 'habitat critical to the survival of the listed threatened species' is identified in recovery plans, relevant recovery plans are listed in **Section 13.2**[4].

In addition, both the EPBC Act and WA BC Act and associated regulations (2018) provide for the listing of critical habitat - habitat 'critical to the survival of the threatened species. No provision is made under the TPWC Act for listing critical habitat.

[4] Further background information on BIA and identification of critical habitat in recovery plans is provided in Section 5.4.

Table 16: Critical habitat/ biologically important areas - birds

Species	Scientific name	Aggregation area and use	Specific geographic locations for species
Australian fairy tern	*Sternula nereis*	Foraging – lower north-west coast, west coast, south coast including islands. Breeding – Pilbara and Gascoyne coasts and islands	Found in the vicinity of lower north-west coast (north to Dampier Archipelago), west coast (south to Peel Inlet) and south coast (from Flinders Bay east to Israelite Bay), including islands (as far offshore as Trimouille Island and Houtman Abrolhos). Pilbara and Gascoyne coasts and islands
Lesser crested tern	*Thalasseus bengalensis*	Breeding, foraging - Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef	Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef
Roseate tern	*Sterna dougallii*	Breeding, foraging – Islands and coastline in the Kimberley, Pilbara and Gascoyne regions Resting – Eighty Mile Beach Foraging & provisioning young– North-western and west coasts and islands from Sir Graham Moore Is (13º50'S), south to Mandurah (32º32'S) and as far offshore as Ashmore Reef, Bedout Island and the Houtman Abrolhos.	Eighty Mile Beach (northern end) Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef Low Rocks and Stern Island in Admiralty Gulf North-east and North-west Twin Islets near the mouth of King sound North-western and west coasts and islands from Sir Graham Moore Is (13º50'S), south to Mandurah (32º32'S) and as far offshore as Ashmore Reef, Bedout Island and the Houtman Abrolhos.
Wedge-tailed shearwater	*Ardenna pacifica*	Breeding, foraging – west coast from Ashmore Reef to Carnac I. Kimberley, Pilbara, Gascoyne coasts, Ashmore reef	Breeding (in hundreds of thousands) off west coast from Ashmore Reef (12º15'S) to Carnac Island (32º07'S), and ranging in western seas between 12º00'S and 33º20'S. Kimberley, Pilbara and Gascoyne coasts and islands including Ashmore Reef

9. Protected Areas

A number of areas in the EMBA are protected under state and federal legislation. Protected areas include World Heritage Areas, Wetlands of International Importance (Ramsar), Wetlands of National Importance, National and Commonwealth Heritage Places, and terrestrial conservation reserves (National Parks, Nature Reserves and Conservation Parks) that bound marine waters. These areas are listed in **Table 17** and shown in **Figure 13** and **Figure 14** discussed below. Other protected areas include Key Ecological Features (discussed in **Section 10**) and State and Commonwealth Marine Parks/Reserves (discussed in **Section 11** and **Section 12**).

Table 17: Summary of protected areas in waters within the EMBA

Area type	Title
World Heritage Area	The Ningaloo Coast
National Heritage Place	The Ningaloo Coast (Natural)
	Dampier Archipelago (including Burrup Peninsula) (Indigenous)
Commonwealth Heritage Place	Ningaloo Marine Area - Commonwealth Waters
Terrestrial Conservation Reserves e.g. national parks, nature reserves, and conservation parks.	Two bounding marine waters – refer to **Section 9.4**.

9.1. World Heritage Areas

There is one World Heritage Area (WHA) located in marine waters off WA: the Ningaloo Coast (2010b).

9.1.1. The Ningaloo Coast

The Ningaloo Coast was included on the World Heritage List in 2011 and was inscribed for outstanding natural universal values as follows:

- An example of superlative natural phenomena and areas of exceptional natural beauty and aesthetic importance
- outstanding examples representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.
- the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The Ningaloo Coast WHA includes (DEWHA 2010b):

- Ningaloo Marine Park (Commonwealth waters)
- Ningaloo Marine Park (Western Australia state waters)
- Muiron Island Marine Management Area (including the Muiron Islands)
- Jurabi Coastal Park
- Bundegi Coastal Park
- Cape Range National Park
- Learmonth Air Weapons Range.

The Ningaloo Coast World Heritage Area (including the Muiron Islands) is managed under a plan that is consistent with the World Heritage Convention and Australia's World Heritage management principles. World Heritage Management principles are set out in regulations and cover matters relevant to the preparation of management plans, the environmental assessment of actions that may affect the property and community consultation processes.

The Australian World Heritage management principles are outlined under Schedule 5 of the EPBC regulations (2000). The objective is to ensure that any likely impact of an action on the World Heritage values of the property should be considered. Any action should be consistent with the protection, conservation, presentation or transmission to future generations of the World Heritage values of the property.

The marine environment of the Ningaloo Coast World Heritage Area is protected as a State Marine Park, a Commonwealth Marine Park, and is discussed further in **Section 11.1.1** and **Section 12.2.2**, respectively.

9.2. National Heritage Places

Natural, historic and indigenous places that are of outstanding heritage value to the Australian nation are recorded as National Heritage Places. The Ningaloo Coast are listed as both World Heritage Areas and National Heritage Places and are discussed in **Section 9.1**.

9.2.1. The Ningaloo Coast

See the Ningaloo Coast World Heritage Area (**Section 9.1.1**).

9.2.2. Dampier Archipelago (including Burrup Peninsula)

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. At a national level it has an exceptionally diverse and dynamic range of schematised human figures and provides an unusual and outstanding visual record of the Aboriginal responses to the rise of sea levels at the end of the last Ice Age (DoEE 2019c).

The site is about 36,860 ha at Dampier and comprises of nine distinct areas of the Burrup Peninsula Areas and part of the following surrounding islands: West Intercourse Island, West Mid Intercourse Island, Enderby Island, Goodwin Island, West Lewis Island and East Lewis Island, Rosemary Island, Brigadier Island, Miller Rocks, Lady Nora Island and Elphick Nob, Malus Islands, Angel Island, Gidley Island, Cohen Island, Keast Island and Collier Rocks, Tozer Island, Dolphin Island, and Unnamed Island (DoEE 2019c).

9.3. Commonwealth Heritage Places

The Commonwealth Heritage Places List comprises natural, indigenous and historic heritage places which are either entirely within a Commonwealth area, or outside the Australian jurisdiction and owned or leased by the Commonwealth or a Commonwealth Authority.. Ningaloo Marine Area – Commonwealth Waters) is found in Marine Parks and are discussed further in **Section 12**. The HMAS Sydney II and HSK Kormoran Shipwreck Sites is listed under both National and Commonwealth Heritage Lists and discussed in **Section 9.3**.

9.3.1. Ningaloo Marine Area – Commonwealth Waters

See the Ningaloo Coast World Heritage Area (**Section 9.1.1**).

9.4. Coastal Terrestrial Conservations Reserves – bound by marine waters

Conservation reserves are created under the Land Administration Act 1997, and once reserved and set aside for conservation purposes are regulated under the *Conservation and Land Management Act (CALM) 1984*. Most conservation reserves in WA are vested in (owned) by the WA Conservation and Parks Commission, an independent statutory body established by the CALM Act 1984, and most are managed by the Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service. Most conservation areas in the NT are managed under the *Territory Parks and Wildlife Conservation Act*.

In WA there are three main types of terrestrial conservation reserves with legislative protection:

- Nature reserves – established for wildlife and landscape conservation; scientific study; and preservation of features of archaeological, historic or scientific interest.
- National parks – as above but also to be used for enjoyment by the public. Have national or international significance.
- Conservation parks – as above but have local or regional significance.

Nature reserves can have an extra classification applied to them and become 'A class' reserves, which generally require an Act of Parliament to alter.

Table 18: Nature Reserves (NR), Conservation Parks (CP), Regional Parks (RP) and Coastal Reserves (CR) in the EMBA

Reserve name and type	Reserve class	IUCN	Management Plan	Includes inter-tidal zone	Adjacent Marine Park (see Section 11)
Reserves of north-west WA					
Unnamed (Dampier Archipelago) NR	A	1a	Dampier Archipelago Management Plan (CALM 1990). *Covers 25 of the islands*	Yes	-
Unnamed NR		1a	-	Yes	-
Montebello Islands CP	A	2	-	Partially [5]	Montebello Islands Marine Park
Lowendal Island NR		1a	-	No	Barrow Island Marine Management Area and Marine Park. Lowendal Island NR only partially bounded
Barrow Island NR	A	1a	Barrow Island Group Nature Reserves (DPAW 2015)	Yes	
Boodie, Double and Middle Islands NR	-	1a		Yes	
Bessieres Island NR	A	1a	-	Yes	-
Serrurier Island NR	-	1a	-	Yes	-
Muiron Islands NR	-	1a	Jarabi and Bundegi Coastal Parks and Muiron Islands (CALM 1999)	No	Muiron Islands Marine Management Area
Nyinggulu CR	-	-	Nyinggulu (Ningaloo) Coastal Reserves Joint Management Plan (DBCA 2022b)	No	Ningaloo Marine Park

[5] Reserve R42197 includes the inter-tidal zone and reserve R42196 does not.

Further information is provided below in relation to Varanus Island.

Lowendal Islands Nature Reserve - Varanus Island

Varanus Island is part of the Lowendal Islands group, a Nature Reserve (Class C). The Lowendal Islands comprise more than 40 limestone islands, islets and rocky stacks. There is not currently a DBCA Management Plan covering the Lowendal Islands Nature Reserve. Varanus Island is the largest island in the Lowendal Islands and is approximately 2.5 km long and 600m wide at its widest point. Its highest point is approximately 30m above sea level.

Described ecological conservation values of marine relevance include: wedge-tailed shearwater nesting (see **Section 8.1.5**); loggerhead and hawksbill turtle nesting (see **Section 6.1.1** and **Section 6.1.3**), flatback turtle nesting (**Section6.1.4**). The Lowendal Islands are described as particularly important for tern breeding (DEC 2002), further information on terns is provided in **Section 8.1.5**.

Santos

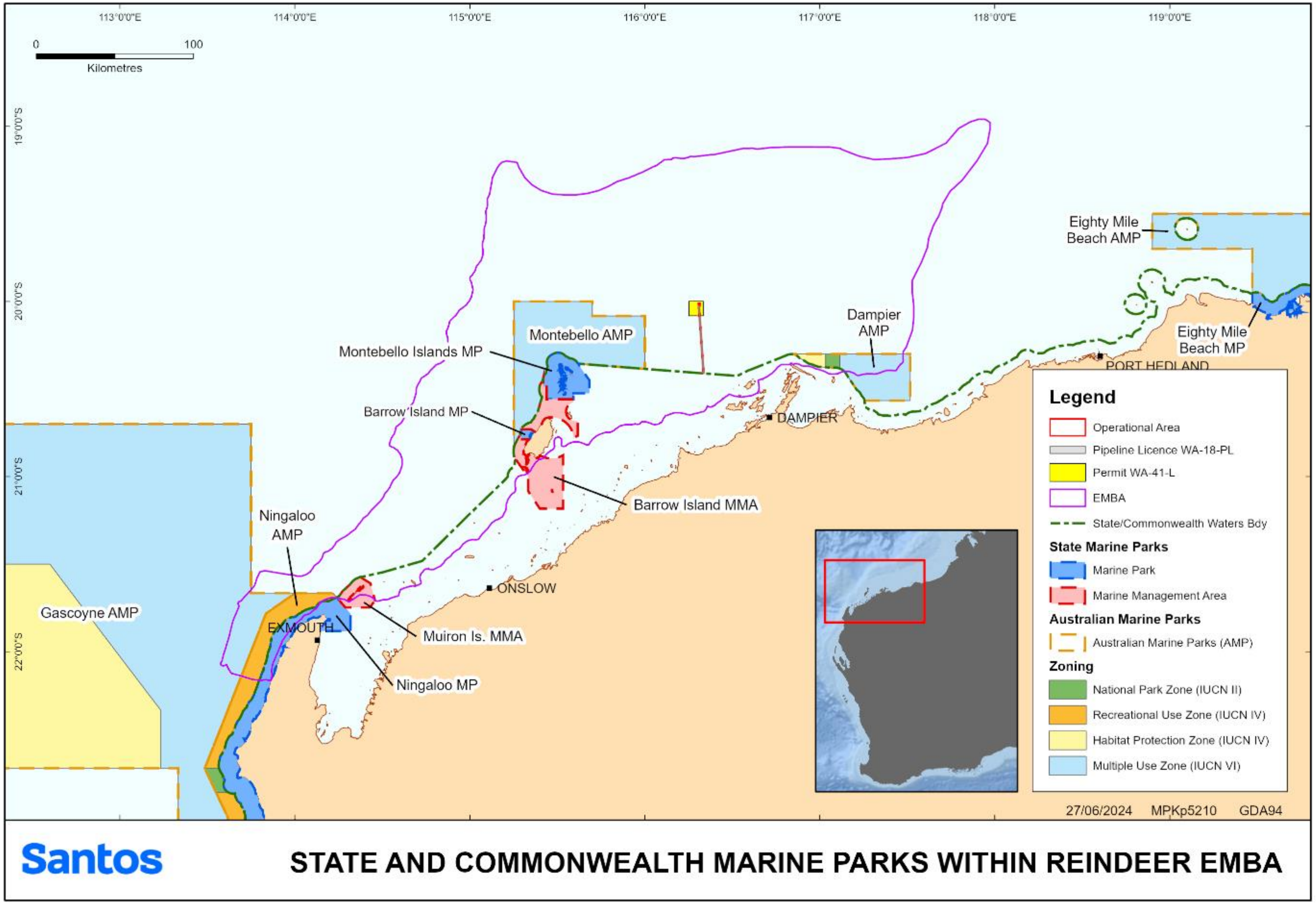


Figure 13: Marine Parks within the EMBA

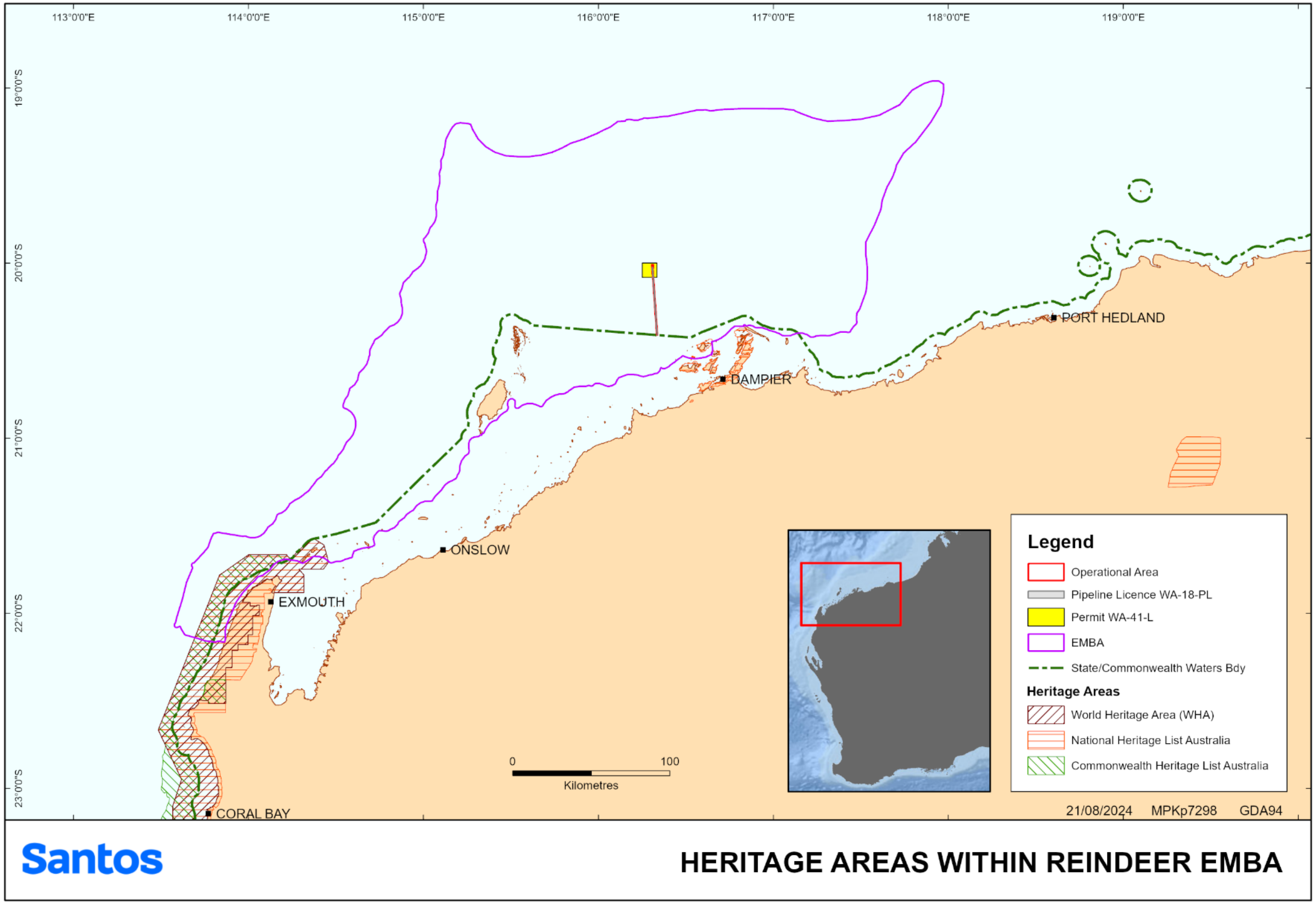


Figure 14: Heritage areas within the EMBA

10. Key Ecological Features

10.1. Introduction

Key ecological features (KEFs) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity. KEFs meet one or more of the following criteria (DSEWPaC 2012):

- A species, group of species or a community with a regionally important ecological role
- 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 biological productivity
  - Aggregations of marine life; or
  - Biodiversity and/or endemism
- A unique sea floor feature with ecological properties of regional significance.

Five key ecological features of the Commonwealth waters in the EMBA have been identified in the protected matters search (**Figure 15**) and are discussed in this section. **Sections 1** and **2** provide an overview of the geomorphology and oceanography of the Indian Ocean. Individual EP will describe specific ecological features outside of the Commonwealth waters that are within that activity's EMBA.

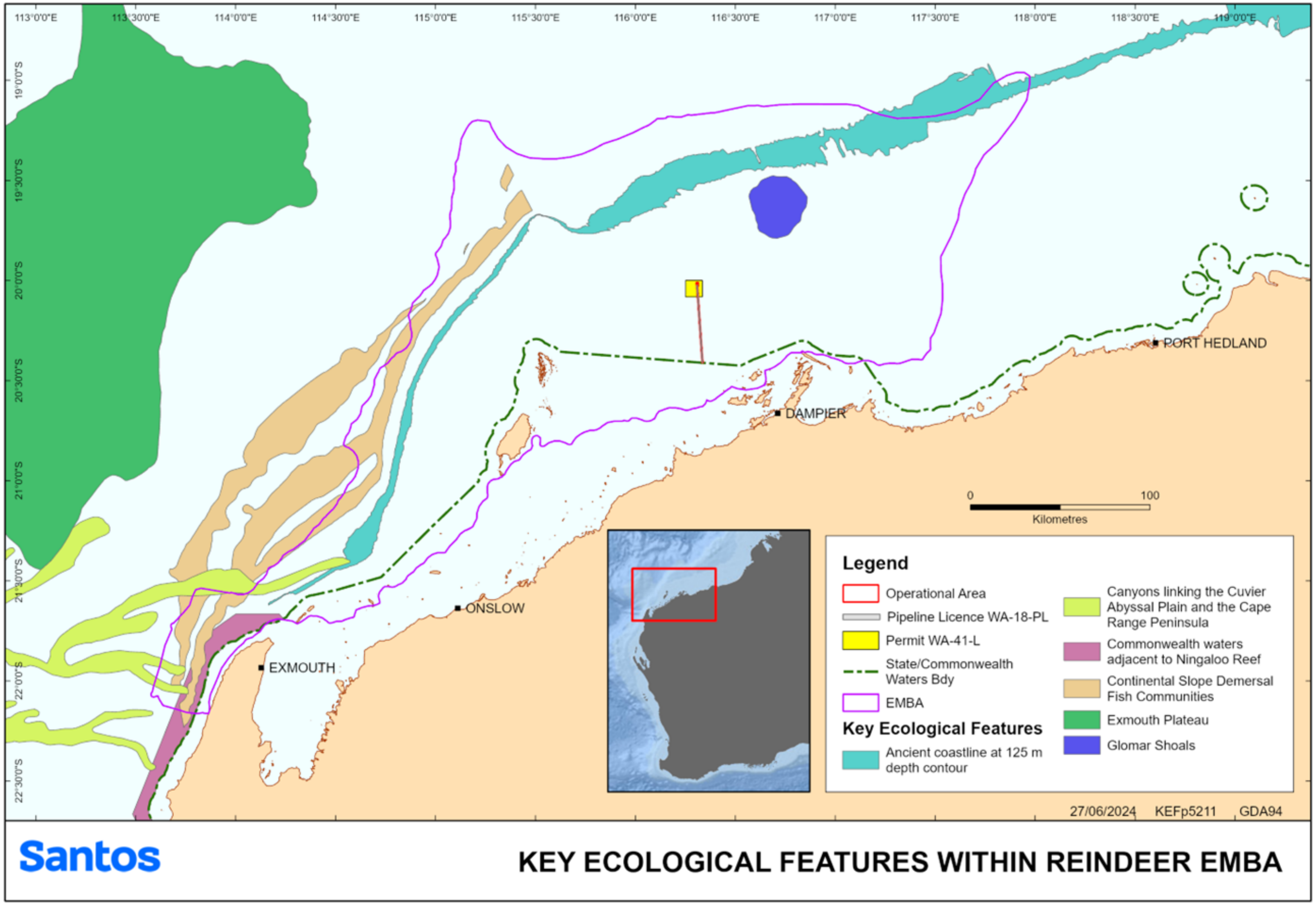


Figure 15: Key Ecological Features within the EMBA

10.1.1. Commonwealth Waters Adjacent to Ningaloo Reef

The Commonwealth Waters adjacent to Ningaloo Reef KEF is defined for high productivity and aggregations of marine life. The Ningaloo Reef extends almost 300 km along the Cape Range Peninsula to the Red Bluff and is globally significant as the only extensive coral reef in the world that fringes the west coast of a continent. Commonwealth waters adjacent to the reef are thought to support the rich aggregations of marine species at Ningaloo Reef through upwellings associated with canyons on the adjacent continental slope and interactions between the Ningaloo and Leeuwin currents (Brewer et al. 2007, DEWHA 2008d, DSEWPaC 2012a). The narrow continental shelf (10 km at its narrowest) means that the nutrients channelled to the surface via canyons are immediately available to reef species. Terrestrial nutrient input is low; hence this deep-water source is a major source of nutrients for Ningaloo Reef and therefore very important in maintaining this system (DEWHA 2008c).

The reef is known to support an extremely abundant array of marine species including over 200 species of coral and more than 460 species of reef fish, as well as molluscs, crustaceans and other reef plants and animals (DEWHA 2008c). Marine turtles, dugongs and dolphins frequently visit the reef lagoon. The Commonwealth waters around Ningaloo include areas of potentially high and unique sponge biodiversity (DEWHA 2008c). Upwellings on the seaward side support aggregations such as whale sharks and manta rays (these waters are the main known aggregation area for whale sharks in Australian waters). Humpback whales are seasonal visitors to the outer reef edge and seasnakes, sharks, large predatory fish and seabirds also utilise the reef and surrounding waters.

This KEF is located partially within the EMBA.

The Ningaloo Marine Park includes this Key Ecological Feature and is discussed in **Section 12.2.2**.

10.1.2. Canyons Linking the Cuvier Abyssal Plain with the Cape Range Peninsula

The Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula are defined as a KEF as they are unique sea floor features with ecological properties of regional significance.

Cape Range Peninsula and the Cuvier Abyssal Plain are linked by canyons, the largest of which are the Cape Range Canyon and Cloates Canyon. These two canyons are located along the southerly edge of Exmouth Plateau adjacent to Ningaloo Reef and are unique due to their close proximity to the North West Cape (DSEWPaC 2012a). The Leeuwin Current interacts with the heads of the canyons to produce eddies resulting in delivery of higher nutrient, cool waters from the Antarctic intermediate water mass to the shelf (Brewer et al. 2007). Strong internal tides also create upwelling at the canyon heads (Brewer et al. 2007). Thus, the canyons, the Exmouth Plateau and the Commonwealth waters adjacent to Ningaloo Reef interact to create the conditions for enhanced productivity seen in this region (Sleeman et al. 2007 in DSEWPaC 2012a). The canyons are also 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 (DSEWPaC 2012a).

The soft bottom habitats within the canyons themselves are likely to support important assemblages of epibenthic species. Biological productivity at the head of Cape Range Canyon in particular, is known to support species aggregations, including whale sharks, manta rays, humpback whales, sea snakes, sharks, large predatory fish and seabirds. The canyons are thought to be significant contributors to the biodiversity of the adjacent Ningaloo Reef, as they channel deep water nutrients up to the reef, stimulating primary productivity (DEWHA 2008c).

This KEF is located wholly within the EMBA.

10.1.3. Glomar Shoals

The Glomar Shoals are a submerged feature situated at a depth of 33–77 m, approximately 150 km north of Dampier on the Rowley Shelf (Falkner et al. 2009 in DSEWPaC 2012a). They consist of a high percentage of marine-derived sediments with high carbonate content and gravels of weathered coralline algae and shells (McLoughlin & Young 1985 in DSEWPaC 2012a). The area's higher concentrations of coarse material compared to surrounding areas are indicative of a high energy environment subject to strong sea floor currents (Falkner et al. 2009 in DSEWPaC 2012a).

Biological communities found at the Glomar Shoals have not been comprehensively studied, however the shoals are known to be an important area for a number of commercial and recreational fish species such as rankin cod, brown striped snapper, red emperor, crimson snapper, bream and yellow-spotted triggerfish. Catch rates at the Glomar Shoals are high, indicating that the area is a region of high productivity (Falkner et al. 2009, Fletcher & Santoro 2009 in DSEWPaC 2012a). It is unclear whether the removal of non-target species due to the commercial fishing over the shoals is having an impact on its value (DSEWPaC 2012a).

The Glomar Shoals are regionally important for their potentially high biological diversity and localised productivity. Biological data specific to the Glomar Shoals is limited, however the fish of the shoals are probably a subset of reef-dependent species and anecdotal evidence suggests they are particularly abundant (DSEWPaC 2012a).

This KEF is located wholly within the EMBA.

10.1.4. Ancient Coastline at 125 m Depth Contour

The shelf of the North-west Marine Region contains several terraces and steps which reflect changes in sea level that occurred over the last 100,000 years. The most prominent of these features occurs at a depth of 125 m as an escarpment along the North West Shelf and Sahul Shelf (DSEWPaC 2012a). Where the ancient, submerged coastline provides areas of hard substrate it may contribute to higher biological diversity in areas otherwise dominated by soft sediments. Little detailed knowledge was available at the time of its designation, but it was thought that the hard substrate of the escarpment is likely to support sponges, crinoids, molluscs, echinoderms (DSEWPaC 2012a) and that changes in topography at these depths are critical points for the generation of internal waves (Holloway et al. 2001 cited in DEWHA 2008c), playing a minor role in aiding localised upwelling or at least regional mixing associated with the seasonal changes in currents and winds. It was hypothesised that this prominent floor feature could be important as a migratory pathway for cetaceans and pelagic species such as the whale shark and humpback whale, as they move north and south between feeding and breeding grounds (DEWHA 2008c). Enhanced productivity could potentially be attracting baitfish, which in turn provide food for the migratory species. The pressures of potential concern on the biodiversity value of this feature generally include ocean acidification as a result of climate change (DoEE 2019a).

Currey-Randall et al. (2021) investigated drivers of fish species richness and assemblage composition spanning six degrees of latitude along sections of the ancient coastline, categorised as ‘on’ and ‘off’ the ancient coastline at 125m KEF (AC125) based on depth, across a range of habitats and seafloor complexity (~60–180 m depth). While some surveyed sections of the AC125 had hard bottom substrate and supported enhanced fish diversity, including over half of the total species observed, species richness and abundance overall were not greater on the AC125 than immediately adjacent to the AC125. Instead, depth, seafloor complexity and habitat type explained patterns in richness and abundance, and structured fish assemblages at both local and broad spatial scales. Fewer fishes were associated with deep sites characterized by negligible complexity and soft-bottom habitats, in contrast to shallower depths that featured benthic biota and pockets of complex substrate. Drivers of abundance of common species were species-specific and primarily related to sampling areas, depth and substrate. Fishes of the ancient coastline and adjacent habitats are representative of mesophotic fish communities of the region, included species important to fisheries and conservation, and several species were observed deeper than their currently known distribution.

Wakeford et al. (2023) investigated the bathymetry, sedimentology and benthic habitats at 5 locations across the AC125 using multibeam sonar, sediment samples and towed video imagery. Approximately 98% of the seabed surveyed was comprised of unconsolidated soft sediment habitat (mud/sand/silt) supporting negligible epibenthic biota. The prevalence of soft sediment suggests that post-glacial sediments have infilled parts of the ancient coastline), with cross-shelf, probably tidal currents in the northern section of the study area responsible for some of the sediment mobilisation and southern study areas more influenced by oceanic conditions. Within study areas, total biotic cover ranged from 0.02% to 1.07%. Of the biota encountered, most comprised filter feeder organisms (including gorgonians, sponges, and whip corals) whose distribution was associated with pockets of consolidated hard substrate. Benthic community composition varied with both study area and position in relation to the predicted AC125. In general, consolidated substrate was proportionally higher in water shallower than the AC125 compared to on the AC125 or deeper than the AC125. Spatially continuous maps of predicted benthic habitat classes (pre-determined benthic communities) in each study area were developed to characterise biodiversity. Spatial modelling corroborated depth and large-scale structural complexity of the seafloor as surrogates for predicting likely habitat class. The study provided an important assessment of the AC125 and concluded that if a distinct coastline exists in the areas surveyed, it is now largely buried and as such does not provide a unique hard substrate habitat. This KEF is located wholly within the EMBA.

10.1.5. Continental Slope Demersal Fish Communities

The Australian Continental Slope provides important habitat for demersal fish communities, characterised by high endemism and species diversity. Specifically, the continental slope between North West Cape and the Montebello Trough is the most diverse slope bioregion in Australia with more than 500 fish species, 76 of which are endemic (Last et al. 2005 in DSEWPaC 2012).

The Continental Slope consists of two distinct community types, associated with the upper and mid slope, 225 – 500 m and 750 – 1000 m respectively. The Timor Province and Northwest Transition bioregions are the second-richest areas for demersal fish across the entire continental slope (DSEWPaC 2012). The bacteria and fauna that is present in the system on the Continental Slope are the basis for the food web for demersal fish and higher order consumers in the system. Further information of this system has been poorly researched, though it has been suggested that it is a detritus-based system, where infauna and epifauna become prey for a range of teleost fish, molluscs and crustaceans (Brewer et al. 2007). The higher order consumers supported by this system are likely to be carnivorous fish, deep water sharks, large squid and toothed whales (Brewer et al. 2007). The pelagic production is known to be phytoplankton based, with hotspots located around oceanic reefs and islands (Brewer et al. 2007).

It is believed that the loss of the benthic habitat along this continental shelf region would likely lead to a decline in the species diversity and endemism that this feature is associated with (DoEE 2019a). The endemism of the region is not supported by large data sets and is scarce. It is consequently not well understood what interactions exist between the physical processes and trophic structures that lead to this high diversity of fish and the suggested presence of endemic species in the region (DoEE 2019a).

This KEF is located wholly within the EMBA.

11. State Marine Conservation Reserves

11.1. Introduction

Marine parks and reserves have been progressively established in Western Australia since 1987 and the Northern Territory since 1983. The Conservation and Parks Commission (CPC) is the vesting authority for marine parks and reserves under the provisions of the *Conservation and Land Management Act 1984*. Parks and Wildlife, within the Department of Biodiversity, Conservation and Attractions (DBCA), is responsible for day-to-day management of the parks.

There are three categories of state marine conservation reserves: marine parks; marine management areas; and marine nature reserves.

Marine parks are created to protect natural features and aesthetic values while allowing recreational and commercial uses that do not compromise conservation values. There are currently 24 marine parks wholly or partially within the EMBA (refer to **Figure 13**).

Marine parks are multiple-use reserves that cater for a wide range of activities. Within marine parks there may be four types of management zones: recreation zones: general use zones; no-take areas known as sanctuary zones; and special purpose zones.

Each marine park has a ‘management plan’ that contains strategies to protect the high value assets in the park, as well as permitted activities tables. These tables provide explicit regulatory management.

Sanctuary zones are ‘no-take' areas created primarily for conservation and scientific research and are designed to protect a particular significant ecosystem or habitat. Low-impact tourism may be permitted, but no recreational or commercial fishing, aquaculture, pearling, petroleum drilling or production is allowed.

Marine management areas provide an integrated management structure over areas that have high conservation value and intensive multiple-use. There are two marine management areas within the EMBA (described below).

11.1.1. Ningaloo Marine Park

The Ningaloo Marine Park was declared in May 1987 under the National Parks and Wildlife Conservation Act 1975 (Commonwealth). The Ningaloo Coast, incorporating both key marine and terrestrial values was later granted World Heritage Status in June 2011. In November 2012, the Ningaloo Marine Park (Commonwealth Waters) was renamed to be incorporated in the North-west Commonwealth Marine Reserves Network. The park covers an area of 263,343 km^2, including both State and Commonwealth waters, extending 25 km offshore.

The park protects a large portion of Ningaloo Reef, which stretches over 300 km from North West Cape south to Red Bluff. It is the largest fringing coral reef in Australia, forming a discontinuous barrier that encloses a lagoon that varies in width from 200 m to 7 km. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). The Ningaloo Marine Park forms the backbone of the nature-based tourism industry, and recreational activities in the Exmouth region. Seasonal aggregations of whale sharks, manta rays, sea turtles and whales, as well as the annual mass spawning of coral attract large numbers of visitors to Ningaloo each year (CALM 2005).

The reef is composed of partially dissected basement platform of Pleistocene marine or Aeolian sediments or tertiary limestone, covered by a thin layer of living or dead coral or macroalgae. Key features that characterise the Ningaloo Reef include (CALM 2005):

- Over 217 species of coral (representing 54 genera)

- Over 600 species of mollusc (clams, oysters, octopus, cuttlefish, snails)
- Over 460 species of fish
- Ninety-seven species of echinoderms (sea stars, sea urchins, sea cucumbers)
- Habitat for numerous threatened species, including whales, dugong, whale sharks and turtles
- Habitat for over 25 species of migratory wading birds listed in CAMBA and JAMBA.

Ningaloo marine park is located wholly within the EMBA.

11.1.2. Muiron Islands Marine Management Area

The Ningaloo Marine Park Management Plan (CALM 2005) created a marine management area (MMA) for the Muiron Islands, immediately adjacent to the northern end of the Park. This is managed as an integrated area together with the Ningaloo Marine Park, but its status as an MMA means that some activities, including oil and gas exploration, are still permitted under a strict environmental assessment process involving DMIRS.

The Muiron Islands located 15 km north-east of the North West Cape, comprise the North and South Muiron Islands and cover an area of 1,400 ha (AHC 2006). They are low limestone islands (maximum height of 18 m above sea level (ASL)) with some areas of sandy beaches, macroalgae and seagrass beds in the shallow waters (particularly on the eastern sides) and coral reef up to depths of 5 m, which surrounds both sides of South Muiron Island and the eastern side of North Muiron Island. The Muiron Islands MMA was WA's first MMA, gazetted in November 2004. It covers an area of 28,616 ha and occurs entirely within state waters (CALM 2005).

Muiron Islands are located wholly within the EMBA.

11.1.3. Barrow Island Marine Park

The Barrow Island Marine Park covers 4,169 ha, all of which is zoned as sanctuary zone (the Western Barrow Island Sanctuary Zone) (DEC 2007a). It includes Biggada Reef, an ecologically significant fringing reef, and Turtle Bay, an important turtle aggregation and breeding area (DEC 2007a). Representative areas of seagrass, macroalgal and deep-water habitat are also represented within the marine park (DEC 2007a). Passive recreational activities (such as snorkelling, diving and boating) are permitted but extractive activities such as fishing and hunting are not.

Barrow Island marine park is located wholly within the EMBA.

11.1.4. Barrow Island Marine Management Area

The Barrow Island MMAis the largest reserve within the Montebello/ Barrow Islands marine conservation reserves, covering 114,693 ha (DEC 2007a). The MMA includes most of the waters around Barrow Island, the Lowendal Islands and the Barrow Island Marine Park, with the exclusion of the port areas of Barrow Island and Varanus Island.

The MMA is not zoned apart from one specific management zone: the Bandicoot Bay Conservation Area. This conservation area is on the southern coast of Barrow Island and has been created to protect benthic fauna and seabirds. It includes the largest intertidal sand/mudflat community in the reserves, is known to be high in invertebrate diversity and is an important feeding area for migratory birds.

As for the other reserves in the Montebello/Barrow Islands marine conservation reserves, the Barrow Island MMA includes significant breeding and nesting areas for marine turtles and the waters support a diversity of tropical marine fauna, important coral reefs and unique mangrove communities (DEC 2007a). Green, hawksbill and flatback turtles regularly use the island's beaches for breeding, and loggerhead turtles are also occasionally sighted.

Barrow Island MMA is located wholly within the EMBA.

11.1.5. Montebello Islands Marine Park

Montebello/ Barrow/ Lowendal Islands are part of a shallow submarine ridge, which extends north from the mainland near Onslow. The ridge contains extensive areas of intertidal and shallow subtidal limestone pavement surrounding the numerous, mostly small islands which are found in the region. The seabed is generally less than 5 m deep and consists of sand veneered limestone pavement with patches of fringing coral reef (DEC 2007a).

The island chain lies entirely within WA State waters, with the State-Commonwealth boundary extending out to encompass the islands and waters 3 nm west of Barrow Island and north of the Montebello Islands. These islands are protected within as marine conservation reserves: Montebello Islands Marine Park, Barrow Islands Marine Park and Barrow Island Marine Management Area.

The Montebello Islands Marine Park (58,331 ha) consists of two sanctuary zones, two recreation zones, one special purpose zone for benthic protection, 11 special purpose zones for pearling and general use zones.

The Montebello Islands comprise over 100 islands, the majority of which are rocky outcrops; rocky shore accounts for 81 % of shoreline habitat (DEC 2007a).

The ecological and conservation values of the Montebello and Barrow Islands Marine Conservation Reserve (MCR) include important habitats including corals reefs and bommies, mangroves, seagrass and macroalgae meadows, rocky shorelines and hard substrate, intertidal sand and mudflat communities. These habitats provide protection, food and habitat for a large diversity of species, including dugongs, turtles, whales, other protected cetaceans and birds as well as sea snakes and fish. The area is considered to have a high biodiversity. The islands also provide feeding and resting areas for migrating shorebirds and seabird nesting areas.

Socio-economic values of the Montebello and Barrow Islands MCR include hydrocarbon exploration and production, pearling, nature-based tourism, commercial and recreational fishing, water sports, European history and maritime heritage and scientific research (DEC 2007)

Special purpose zones for pearling are established for the existing leaseholder to allow pearling to be the priority use of these areas (DEC 2007a). Commercial fishing includes a trap fishery for reef fishes, mainly in water depths of 30–100 m, and wet lining for reef fish and mackerel. Fish trawling also occurs in the waters near to the Montebello Islands. A tourist houseboat operates out of Claret Bay, at the southern end of Hermite Island, during the winter months. The Montebello Islands are becoming more frequently used by recreational boaters for camping, fishing and diving activities.

Montebello Islands marine park is located wholly within the EMBA

12. Australian Marine Parks

12.1. Introduction

In agreement with the states and NT governments, the Australian Commonwealth government committed to establish Commonwealth marine parks as a component of the National Representative System of Marine Protected Areas (DoE 2014) (**Figure 13**). In November 2012, the Commonwealth Marine Reserves Network was proclaimed with the purpose of protecting the biological diversity and sustainable use of the marine environment (Director of National Parks 2012a). Commonwealth Marine Reserves were renamed as Australian Marine Parks in October 2017. Seven marine regions are included in the Australian Marine Parks Network, including the Coral Sea, , the North-west The marine park networks pertinent (i.e. marine parks wholly or partially within the EMBA) to the EMBA include the:

- North-West Marine Parks Network

The North-West Marine Parks Network comprises 4 marine parks which all occur in West Australian waters pertinent to the EMBA:

- Gascoyne Marine Park (partially within the EMBA)
- Ningaloo Marine Park (partially within the EMBA)
- Montebello Marine Park (wholly within the EMBA)
- Dampier Marine Park (partially within the EMBA)

The sizes of these marine parks range from 300—152,000 km^2, and the water depths within the marine parks vary from approximately 15—1,500 m deep. The EPBC Act requires that each management plan assign an International Union for the Conservation of Nature (IUCN) category to each marine park. Additionally, the Act also allows for the management plan to divide a marine park into zones and to assign a category to each zone, which may differ from the overall category of the marine park. Zoning considers the purposes for which the marine parks were declared, the objectives of the relevant management plans, the values of the marine park and requirements of the EPBC Act and EPBC Regulations.

The North-West Marine Parks Network includes six different types of zoning:

- Sanctuary Zone (IUCN Category Ia)
- National Park Zone (IUCN Category II)

- Recreational Use Zone (IUCN Category IV)
- Habitat Protection Zone (IUCN Category IV)
- Multiple Use Zone (IUCN Category VI)
- Special Purpose Zone (Trawl) (VI).

A summary of the North-West Marine Parks Networks is provided below.

12.2. North-West Marine Park Network

The North-West Marine Parks Network is aligned to the North-west Marine Region. The network covers 335, 341 km^2 and includes 13 marine parks (Director of National Parks, 2018b). Broad values of the North-west Commonwealth Marine Reserves Network include:

- Natural values
- Cultural values
- Heritage values
- Socio-economic values.

Further detail on each of the relevant marine parks within the EMBA is provided below. See **Section 12.1** for extent of marine parks (wholly or partially) within the EMBA.

12.2.1. Gascoyne Marine Park

The Gascoyne Marine Park (Multiple Use Zone – IUCN Category VI-33,652 km^2; Habitat Protection Zone – IUCN Category IV-38,982 km^2; Marine National Park Zone – IUCN Category II-9,132 km^2) covers an area of approximately 81,766 km^2 and protects the following conservation values (Director of National Parks 2018a):

- Important foraging areas for: migratory seabirds threatened and migratory hawksbills and flatback turtles; and vulnerable and migratory whale shark.
- A continuous connectivity corridor from shallow depths around 15 m out to deep offshore waters on the abyssal plain at over 5,000 m in depth
- Sea floor features including canyon, terrace, ridge, knolls, deep hole/valley and continental rise. It also provides protection for sponge gardens in the south of the reserve adjacent to Western Australian coastal waters.
- Ecosystems examples from the Central Western Shelf Transition, the Central Western Transition and the Northwest province provincial bioregions as well as the Ningaloo meso-scale bioregion
- Four KEFs for the region:
  - Canyons on the slope between the Cuvier Abyssal Plain and the Cape Range Peninsula (enhanced productivity, aggregations of marine life and unique sea-floor feature)
  - Exmouth Plateau (unique sea-floor feature associated with internal wave generation)
  - Continental slope demersal fish communities (high species diversity and endemism – the most diverse slope bioregion in Australia with over 500 species found with over 64 of those species occurring nowhere else)
  - Commonwealth waters adjacent to Ningaloo Reef.
- The canyons in this reserve are believed to be associated with the movement of nutrients from deep water over the Cuvier Abyssal Plain onto the slope where mixing with overlying water layers occurs at the canyon heads. These canyon heads, including that of Cloates Canyon, are sites of species aggregation and are thought to play a significant role in maintaining the ecosystems and biodiversity associated with the adjacent Ningaloo Reef
- The reserve therefore provides connectivity between the inshore waters of the existing Ningaloo Commonwealth marine park and the deeper waters of the area.

The park is also adjacent to World Heritage listings associated with the Ningaloo Coast. Commercial tourism, commercial fishing, mining and recreation are important socio-economic values of the park (Director of National Parks 2018b).

12.2.2. Ningaloo Marine Park

Ningaloo Marine Park stretches approximately 300 km along the west coast of the Cape Range Peninsula and is adjacent to the Western Australian Ningaloo Marine Park and Gascoyne Marine Park (Director of National Parks, 2018b). Ningaloo Reef is the longest fringing barrier reef in Australia forming a discontinuous barrier that encloses a lagoon that varies in width from 200 m to 7 km. Gaps that regularly intercept the main reef line provide channels for water exchange with deeper, cooler waters (CALM 2005). It is the only example in the world of extensive fringing coral reef on the west coast of a continent.

The Ningaloo Marine Park (Recreational Use Zone – IUCN Category II) covers an area of approximately 2,435 km^2 and protects the following conservation values (Director of National Parks 2018a):

- Important habitat (foraging areas) for vulnerable and migratory whale sharks
- Areas used for foraging by marine turtles adjacent to important internesting sites
- Part of the migratory pathway of the protected humpback whale
- Foraging and migratory pathway for pygmy blue whales
- Breeding, calving, foraging and nursing habitat for dugong
- Shallow shelf environments which provides protection for shelf and slope habitats, as well as pinnacle and terrace sea floor features
- Sea floor habitats and communities of the Central Western Shelf Transition
- Three KEFs
- The Ningaloo Coast World Heritage Property, the Ningaloo Coast National Heritage listing and Ningaloo Marine Area Commonwealth Heritage Listing.

Commercial tourism and recreation (e.g. fishing) are important socio-economic values of the marine park (Director of National Parks 2018b).

12.2.3. Montebello Marine Park

The Montebello Marine Park is located offshore of Barrow Island and 80 km west of Dampier extending from the Western Australian state water boundary and is adjacent to the Western Australian Barrow Island and Montebello Islands Marine Parks. The Montebello Marine Park (Multiple Use Zone – IUCN Category VI) covers an area of approximately 3,413 km^2 and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas for migratory seabirds that are adjacent to important breeding areas
- Areas used by vulnerable and migratory whale sharks for foraging
- Foraging areas marine turtles which are adjacent to important nesting sites
- Section of the north and south bound migratory pathway of the humpback whale
- Shallow shelf environments with depths ranging from 15–150 m which provides protection for shelf and slope habitats, as well as pinnacle and terrace sea floor features
- Sea floor habitats and communities of the Northwest Shelf Province provincial bioregions as well as the Pilbara (offshore) meso-scale bioregion
- One KEF for the region is the ancient Coastline (a unique sea floor feature that provides areas of enhanced biological productivity).

Commercial tourism, commercial fishing, mining and recreation are important socio-economic values for the park.

12.2.4. Dampier Marine Park

The Dampier Marine Park (Marine National Park Zone – IUCN Category I-73 km^2; Habitat Protection Zone – IUCN Category IV-104 km^2; Multiple Purpose Zone – IUCN Category VI-1,074 km^2) covers an area of approximately 1,252 km^2 and protects the following conservation values (Director of National Parks 2018b):

- Foraging areas for migratory seabirds that are adjacent to important breeding grounds
- Important foraging areas for marine turtles adjacent to significant nesting sites
- Part of the migratory pathway of the protected humpback whale
- Protection for offshore shelf habitats and shallow shelf habitats adjacent to the Dampier Archipelago

- Communities and sea floor habitats of the Northwest Shelf Province provincial bioregion as well as the Pilbara (nearshore) and Pilbara (offshore) meso-scale bioregions are included.

Port activities, commercial fishing and recreation (e.g. fishing) are important activities in the marine park (Director of National Parks 2018b). No heritage listings apply to the marine park.

13. Conservation Management Plans

In order to protect, maintain and enhance recovery of certain threatened species and ecological communities the DAWE may prepare conservation management plans in the form of Conservation Advice or Recovery Plans.

13.1. Conservation Advice

When a native species or ecological community is listed as threatened under the EPBC Act, conservation advice is developed to assist its recovery. Conservation advice provides guidance on immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species or ecological community.

13.2. Recovery Plans

The Australian Government Minister for the Environment may make or adopt and implement recovery plans for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the Commonwealth EPBC Act. Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long-term survival in the wild of a threatened species or ecological community (DCCEEW, 2024).

Table 19: Threats and strategies from recovery plans, conservation advice and management plans relevant to the activity EMBA

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity
Cetaceans		
Blue whale	Blue Whale Conservation Management Plan 2015-2025 (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference
		Habitat modification
		Vessel disturbance
		Climate Variability and Change
		Marine Debris
Fin whale	Approved Conservation Advice for Balaenoptera physalus (fin whale) (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Anthropogenic noise and acoustic disturbance
		Climate and oceanographic variability and change
		Habitat degradation including pollution (persistent toxic pollutants)
		Vessel strike
Sei whale	Approved Conservation Advice for Balaenoptera borealis (sei whale) (2015) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (CoA, 2018)	Anthropogenic noise and acoustic disturbance
		Climate and oceanographic variability and change
		Habitat degradation including pollution (persistent toxic pollutants)
		Marine debris
		Vessel strike
Southern right whale	Conservation Management Plan for the Southern Right Whale 2011-2021 (2012) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018) National Recovery Plan for the Southern Right Whale (Eubalaena australis) (CoA, 2024)	Habitat modification
		Climate variability and change
		Vessel disturbance
		Noise interference
Marine Reptiles		

<table>
<tr><th>Name</th><th>Recovery Plan, Conservation Advice or Management Plan</th><th>Threats and Strategies Identified as Relevant to the Activity</th></tr>
<tr><td>Short-nosed seasnake</td><td>Approved Conservation Advice on Aipysurus apraefrontalis (short-nosed seasnake) (2011)</td><td>Degradation of reef habitat</td></tr>
<tr><td>Leaf-scaled Seasnake</td><td>Approved Conservation Advice for Aipysurus foliosquama (Leaf-scaled Sea Snake) (2011)</td><td>Habitat degradation</td></tr>
<tr><td rowspan="7">Loggerhead turtle</td><td rowspan="7">National Light Pollution Guidelines for Wildlife (DCCEEW 2023)
Recovery Plan for Marine Turtles in Australia 2017-2027 (2017)
Loggerhead turtle – WA genetic stock
Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)</td><td>Noise interference</td></tr>
<tr><td>Marine debris</td></tr>
<tr><td>Climate variability and change</td></tr>
<tr><td>Deteriorating water quality</td></tr>
<tr><td>Vessel disturbance</td></tr>
<tr><td>Loss of habitat and/or habitat modification</td></tr>
<tr><td>Light pollution</td></tr>
<tr><td rowspan="6">Green turtle</td><td rowspan="6">National Light Pollution Guidelines for Wildlife (DCCEEW 2023)
Recovery Plan for Marine Turtles in Australia 2017-2027 (2017)
Green turtle – NWS genetic stock (NWS), Scott-Browse genetic stock (ScBr), Ashmore genetic stock (AR)
Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)</td><td>Noise interference</td></tr>
<tr><td>Climate variability and change</td></tr>
<tr><td>Deteriorating water quality</td></tr>
<tr><td>Marine debris</td></tr>
<tr><td>Vessel disturbance</td></tr>
<tr><td>Light pollution</td></tr>
<tr><td rowspan="8">Leatherback turtle, leathery turtle</td><td rowspan="8">Approved Conservation Advice on Dermochelys coriacea (2008)
National Light Pollution Guidelines for Wildlife (DCCEEW 2023)
Recovery Plan for Marine Turtles in Australia 2017-2027 (2017)
Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)</td><td>Boat strike</td></tr>
<tr><td>Changes to breeding sites</td></tr>
<tr><td>Marine debris</td></tr>
<tr><td>Noise interference</td></tr>
<tr><td>Deteriorating water quality</td></tr>
<tr><td>Climate variability and change</td></tr>
<tr><td>Loss of habitat</td></tr>
<tr><td>Vessel disturbance</td></tr>
</table>

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity
		Light pollution
Hawksbill turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference
		Deteriorating water quality
		Marine debris
		Climate variability and change
		Loss of habitat
		Vessel disturbance
		Light pollution
Flatback turtle	National Light Pollution Guidelines for Wildlife (DCCEEW 2023) Recovery Plan for Marine Turtles in Australia 2017-2027 (2017) Flatback turtle – Pilbara coast genetic stock (Pil), South-west Kimberley coast genetic stock (swKim) and Cape Domett (CD) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Noise interference
		Deteriorating water quality
		Climate variability and change
		Marine debris
		Loss of habitat
		Vessel disturbance
		Light pollution
Fish and Sharks		
Whale shark	Approved Conservation Advice for Rhincodon typus (whale shark) (2015)	Marine debris
		Climate change
		Boat strike from large vessel
Grey nurse shark (west coast population)	Recovery Plan for the Grey Nurse Shark (Carcharias taurus) (2014) Threat Abatement Plan for Impacts of Marine Debris on Vertebrate Wildlife of Australia's Coasts and Oceans (2018)	Ecosystem effects as a result of habitat modification and pollution effects
		Climate variability and change including sea temperatures and ocean acidification
		Marine debris
Great white shark	Recovery Plan for the White Shark (Carcharodon carcharias) (2013)	Ecosystem effects as a result of habitat modification

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity
Dwarf sawfish	Approved Conservation Advice on Pristis clavata (dwarf sawfish) (2009)	Habitat degradation and modification
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	
Green sawfish	Approved Conservation Advice on Pristis zijsron (green sawfish) (2008)	Habitat degradation and modification
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	
Freshwater sawfish	Conservation Advice for Pristis pristis (largetooth sawfish) (2014)	Commercial, recreational, Indigenous, illegal, unreported and/or unregulated fishing
		Habitat degradation and modification
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	Habitat degradation and modification
Northern river shark	Approved Conservation Advice for Glyphis sp. C (Northern River Shark) (2014)	Commercial, recreational, Indigenous, illegal, unreported and/or unregulated fishing
		Habitat degradation and modification
	Sawfish and River Sharks Multispecies Recovery Plan (2015)	Habitat degradation and modification
Birds		
All seabirds and shorebirds	National Light Pollution Guidelines for Wildlife (DCCEEW 2023)	Habitat modification
		Climate change and variability
		Light pollution
Seabirds	Wildlife Conservation Plan for Seabirds (CoA 2020)	Anthropogenic disturbance
		Climate change
		Invasive species
		Pollution (marine debris, light, water)
		Habitat loss or modification

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity
Migratory shorebirds	Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015)	Habitat loss and degradation
		Climate change and variability
		Pollution (marine debris, light, water)
Sharp-tailed Sandpiper	Conservation advice for Calidris acuminata (sharp-tailed sandpiper) (DCCEEW 2024b) Wildlife Conservation Plan for Migratory Shorebirds (CoA 2015)	Climate change
		Chronic and acute pollution
Red knot	Approved Conservation Advice for Calidris canutus (red knot) (2024) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation
		Climate change
		Pollution/contamination impacts
Southern giant petrel	National Recovery Plan for Albatrosses and Petrels (2022)	Marine pollution
		Climate variability and change
		Habitat loss, disturbance and modifications
Northern giant-petrel	National Recovery Plan for Albatrosses and Petrels (2022) Background paper, population status and threats to albatrosses and giant petrels listed as threatened under the EPBC Act 1999 (2011)	Marine pollution
		Habitat loss, disturbance and modifications
		Climate variability and change
Greater sand plover	Approved Conservation Advice Charadrius leschenaultia greater sand plover (2023) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation
		Climate variability and change
		Pollutant/contaminant impacts
Curlew sandpiper	Approved Conservation Advice for Calidris ferruginea (curlew sandpiper) (2023) Wildlife Conservation Plan for Migratory Shorebirds (2015)	Habitat loss and degradation from pollution
		Climate variability and change
Eastern curlew	Approved Conservation Advice for Numenius madagascariensis (far eastern curlew) (2023)	Habitat loss and degradation from pollution
		Habitat loss and degradation

Name	Recovery Plan, Conservation Advice or Management Plan	Threats and Strategies Identified as Relevant to the Activity
Northern Siberian bar-tailed godwit	Approved Conservation Advice for Limosa lapponica menzbieri (Yakutian bar-tailed godwit) (2024)	Pollution/contamination impacts
Australian fairy tern	Commonwealth Conservation Advice on Sternula nereis nereis (fairy tern) (2011) National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis) (2020)	Oil spills
		Habitat loss, disturbance and modifications
		Climate variability and change
Campbell albatross	National Recovery Plan for Albatrosses and Petrels 2011-2016 (DSEWPaC, 2022)	Marine pollution
		Climate variability and change
		Habitat loss, disturbance and modifications
White-winged fairy wren	Approved Conservation Advice for Malurus leucopterus edouardi (White-winged Fairy-wren (Barrow Island))	Habitat loss, disturbance and modification
Red-tailed tropicbird	Conservation Advice for Phaethon rubricauda westralis (Indian Ocean red-tailed tropicbird) (2023) Wildlife Conservation Plan for Migratory Seabirds (2020)	Climate variability and change
		Marine pollution
		Habitat loss, disturbance and modification
Australian painted snipe	Approved Conservation Advice for Rostratula australis (Australian painted snipe) (2013) National Recovery Plan for the Australian Painted Snipe (Rostratula australis) (2022a)	Habitat loss and degradation
		Oil spills
		Marine plastics/ debris
		Marine pollution
		Climate variability and change

14. Social and Economic Features

14.1. Industry

In 2020/21, Western Australia's petroleum industry was worth $23 billion. The petroleum sector accounted for 10.4 % of the total value of WA's mineral and petroleum sales in 2020/21, with 7.5 % of all mineral and petroleum sales coming from Liquefied Natural Gas (LNG). This is a 37 % decrease in prices compared to 2018/19. The decrease was accounted for by a drop in oil prices due to excess supply from the COVID-19 pandemic and related economic shutdowns, operation issues at Gorgon, Prelude remaining offline until January 2021 along with maintenance shutdowns at the North West Shelf and Wheatstone. Currently Western Australia has five operating LNG projects; the North West Shelf, Gorgon, Pluto, Wheatstone and Prelude. There are also a number of Floating Production and Storage Offtake (FPSO) facilities in the Timor Sea and North West Shelf. Offshore development is focussed on the Carnarvon Basin, Browse Basin and on the North West Shelf (DMP 2014). There are also domestic gas plants on Varanus Island in the North West Shelf, Devil Creek Onshore Gas Plant and Macedon Gas Plant in the Pilbara region and an oil facility near Dongara called Cliff Head. There are several exploration and production permits and leases throughout WA and Commonwealth waters in the EMBA.

14.2. Other Infrastructure

The Jasuraus submarine communication cable links Australia with Indonesia. The cable was installed as a link from Australia to provide telephone services connection to the world in 1995-1996. Travelling north out of Port Hedland for approximately 210 km the cable then heads north-west toward Jakarta, Indonesia. The cable runs up through Permit Areas WA-435-P and WA437-P. Its capacity and major role was overtaken in 2000 by other subsea cables out of Australia. However, Telstra continues to manage the cable as it remains an emergency backup link out of Australia. The cable includes two submerged repeaters in the wider region.

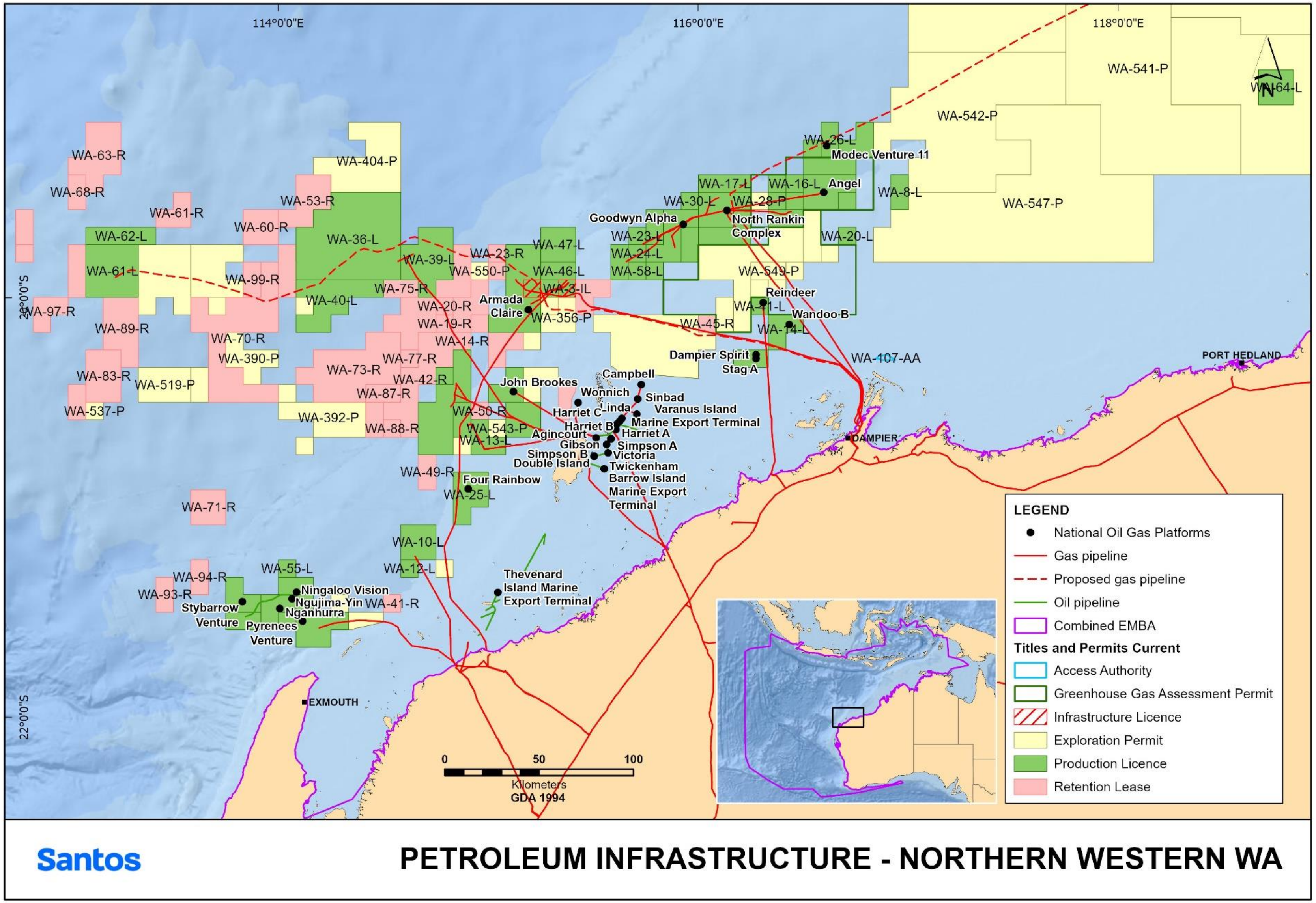


Figure 16: Existing petroleum infrastructure, permits and licences – Northern Western WA

14.3. Shipping

The Western Australian coastline supports twelve ports including the major ports of Dampier, Port Hedland and Broome which are operated by their respective port authorities. Large cargo vessels move through the region to and from Fremantle, transiting along coastline. Commercial shipping also moves to and from marine terminals associated with the oil and gas industry (see **Section 14.1**). Other large ports include Geraldton, Busselton, Albany and Esperance. Closer proximity shipping also includes construction vessels/barges/dredges, domestic support vessels, and offshore survey vessels.

The Australian Maritime Safety Authority (AMSA) has established a network of shipping fairways off the north-west coast of Australia to manage traffic patterns (AMSA 2013). The Shipping Fairways are designed to keep shipping traffic away from offshore infrastructure and aims to reduce the risk of collision (AMSA 2013).

Use of the fairways is strongly recommended but not mandatory. The International Regulations for *Preventing Collisions at Sea 1972* apply to all vessels navigating within or outside the shipping fairways. The use of these fairways does not give vessels any special right of way (AMSA 2012).

Under the *Commonwealth Navigation Act 2012*, certain vessels operating in Australian waters are required to report their location on a daily basis to the Rescue Coordination Centre (RCC) in Canberra. This Australian Ship Reporting System (AUSREP) is an integral part of the Australian Maritime Search and Rescue system and is operated by AMSA through the RCC. Vessels recorded in waters in the combined EMBA through the AUSREP system in 2023 are shown in **Figure 17.**

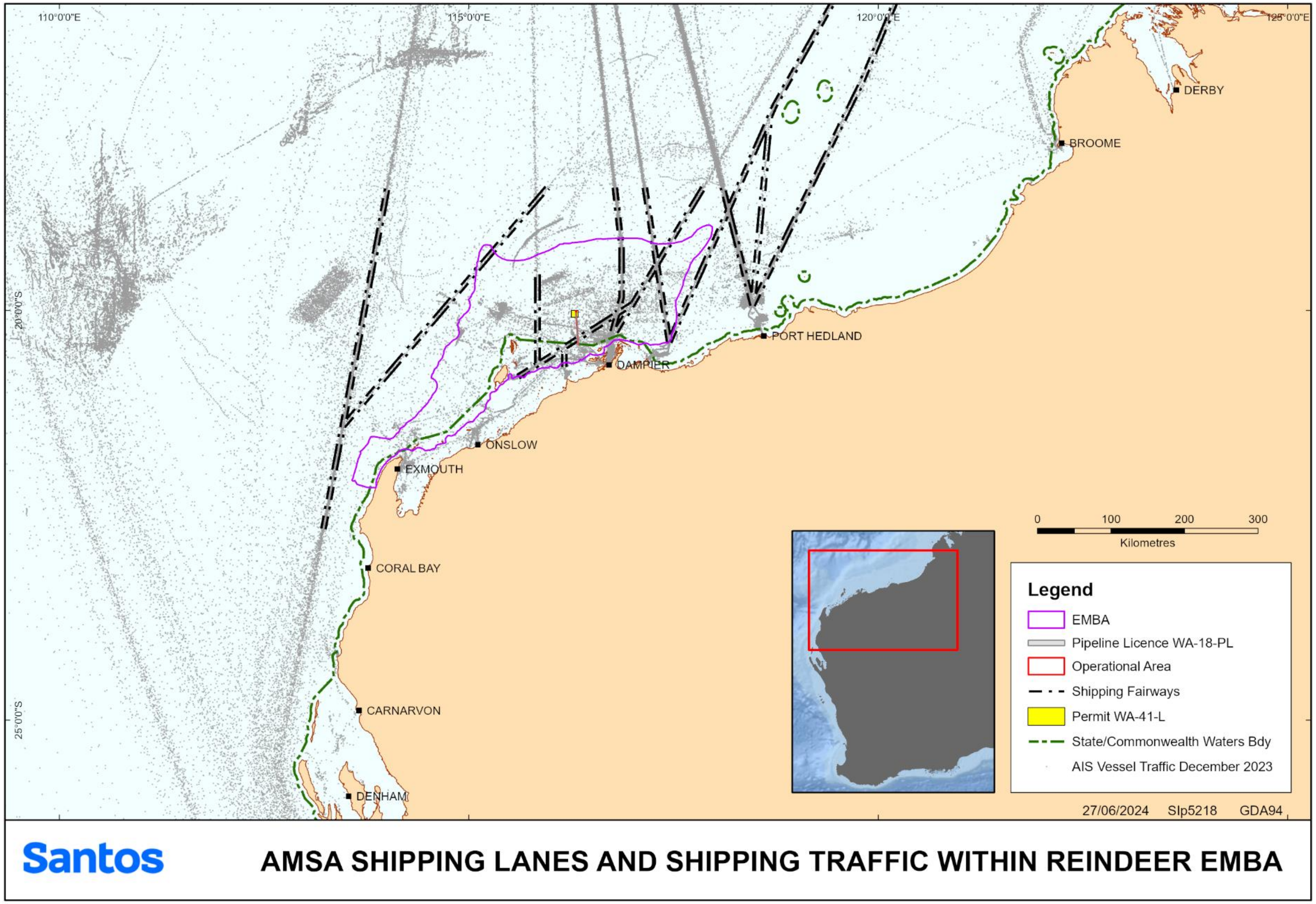


Figure 17: AMSA ship locations and shipping routes

14.4. Defence Activities

The Naval Communication Station Harold E. Holt is located on the northwest coast of Australia, 6 km north of Exmouth. The town of Exmouth was built at the same time as the communications station to provide support to the base and to house dependent families of US Navy personnel (Shire of Exmouth 2018, DoE 2014).

The station provides very low frequency radio transmission to US Navy and Royal Australian Navy ships and submarines in the western Pacific Ocean and eastern Indian Ocean. With a transmission power of 1 megawatt, it is the most powerful transmission station in the southern hemisphere (Shire of Exmouth 2018, DoE 2014).

Two Royal Australian Airforce (RAAF) bases are located in the northwest of WA; Learmonth RAAF Base, near Exmouth and Curtin RAAF Base near Derby (RAAF 2014).

Designated military exercise areas occur over waters and airspace of the north west of WA and may be activated following the required notifications.

Additional defence activities that occur within the EMBA include:

- Exmouth admin and high frequency transmitting
- Exmouth Very Low Frequency transmitting station
- Learmonth – air weapons range
- Learmonth radar site – Vlaming Head Exmouth

14.5. Tourism

The Kimberley, Pilbara and Gascoyne regions are popular visitor destination for Australian and international tourists. Tourism is concentrated in the vicinity of population centres including Broome, Dampier, Exmouth, Coral Bay and Shark Bay.

Marine tourism to offshore Islands includes various Pilbara nearshore Islands (Muiron, Serrurier, Sholl and Montebello) and the Abrolhos Islands near Geraldton. Currently visitation to the Abrolhos is low because the park is only accessible via recreational boat, charter flight or commercial tour (either on a boat or aircraft); however, there is an increasing number of visitors, with visitations peaking between February and May (DBCA, 2022). The Montebello Islands are ranked among the world's most bio-diverse marine environments (DBCA) and are attracting a growing number of nature-based tourism operators, with people participating in activities such as fishing, diving, wildlife viewing, island exploration and surfing (DEC 2007).

Tourism contributes to local economies in terms of both income and employment and tourists include local, interstate and international visitors. Popular water-based activities include fishing, swimming, snorkelling/ diving, surfing/windsurfing/kiting and boating, while popular land-based activities include bushwalking, camping, bird watching and four-wheel driving.

Seasonal nature-based tourism such as humpback whale watching, whale shark encounters and tours of turtle hatching mainly occurring around Ningaloo Reef, Cape Range National Park, Broome and Perth (Tourism Western Australia 2014). Seasonal aggregations of whale sharks, manta rays, sea turtles and whales, as well as the annual mass spawning of coral attract large numbers of visitors to Ningaloo each year (CALM 2005).

14.6. Maritime Heritage

Details of recorded shipwreck sites are available on the Australian National Shipwreck Database are managed by the DCCEEW although precise locations of the wrecks are sometimes unknown. Key shipwrecks in the EMBA are shown in Figure 18**.** Under the Commonwealth *Underwater Culture Heritage Act 2018* all shipwrecks older than 75 years are protected, while those dated pre-1900 are protected by WA law under the *Maritime Archaeology Act 1973*. Within the EMBA, there are 1123 shipwrecks known to be in excess of 75 years old as of March 2024.

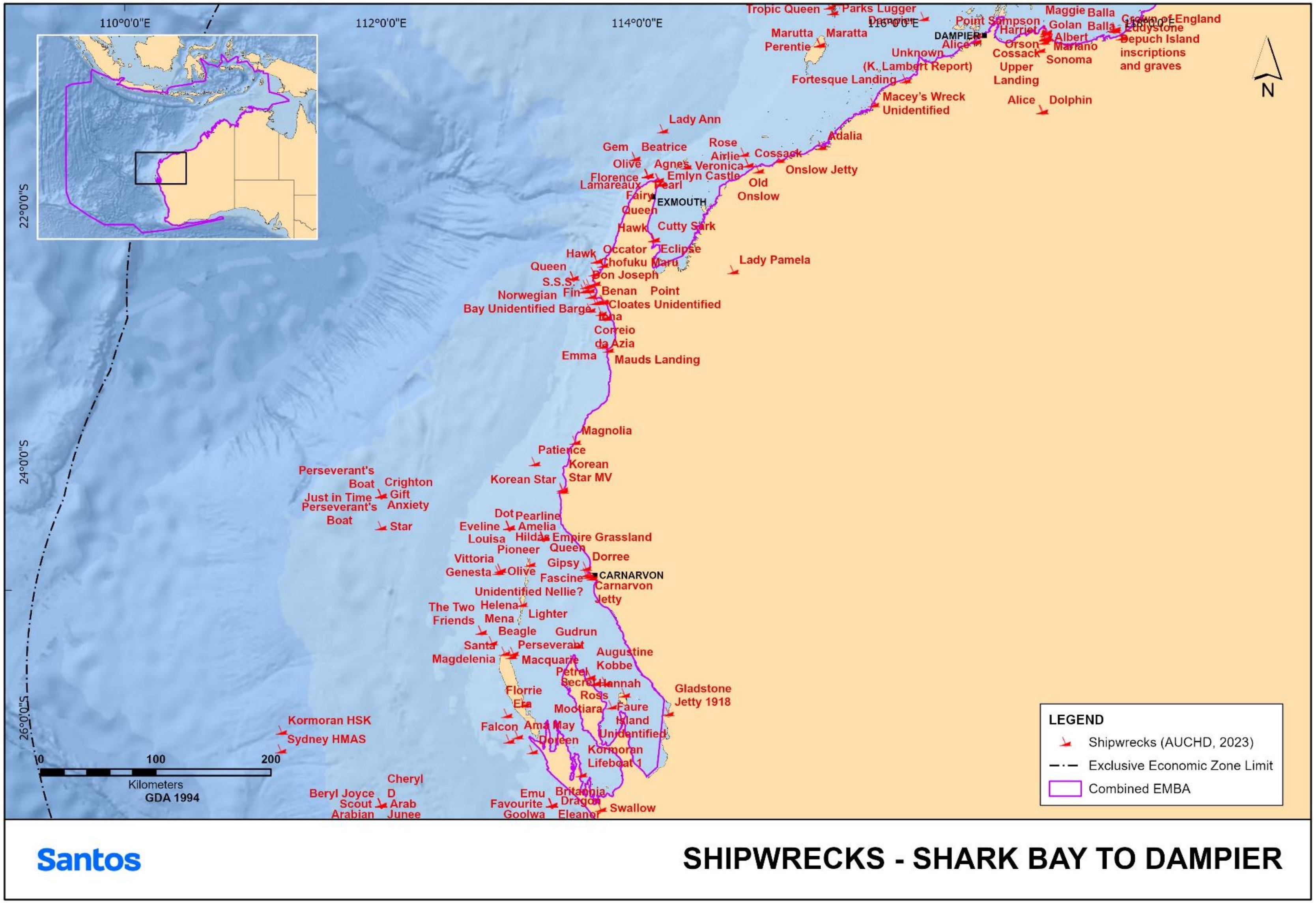


Figure 18: Shipwrecks – Shark Bay – Dampier

14.7. Commercial Fisheries

A valuable and diverse commercial fishing industry is supported by both the offshore and coastal waters in the North Coast, Gascoyne, West Coast and South Coast Bioregions between the WA and NT and South Australian borders. The major fisheries in this area target tropical finfish, large pelagic fish species, crustaceans (prawns and scampi), Western Rock Lobster and pearl oysters (Fletcher and Santoro 2013). A number of smaller fisheries also exist in this area including the specimen shell and abalone fisheries.

14.7.1. State Fisheries

State fisheries are managed by the WA Department of Primary Industries and Regional Development (DPIRD) (formerly Department of Fisheries (DoF)) with specific management plans, regulations and a variety of subsidiary regulatory instruments under the *Fish Resources Management Act 1994* (WA). The information on State managed fisheries has been derived from '*The State of the Fisheries'* Report 20 (Newman et al. 2023) and direct consultation with DPIRD. Santos consults regularly with State fisheries relevant to activity operational areas, mainly by distribution of an Annual Consultation Update by post (as well as conducting further consultation in preparing an EP under s 25 of the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2023.

State commercial fisheries that exist within the EMBA are shown in **Figure 19** and **Figure 20**. A summary of all commercial fisheries wholly or partially operating in the EMBA is also provided in **Table 20**. These are:

State Managed

- Pearl Oyster Managed Fishery
- Onslow Prawn Limited Entry Fishery
- Mackerel Managed Fishery (Area 2)
- Pilbara Demersal Scalefish Fisheries (includes trap and trawl fisheries)
- Pilbara Line Fishery
- Pilbara Crab Managed Fishery
- Nickol Bay Prawn Managed Fishery
- Exmouth Gulf Prawn Managed Fishery

Whole of State Fisheries

- Marine Aquarium Fish Fishery
- Specimen Shell Managed Fishery
- West Coast Deep Sea Crustacean Managed Fishery
- South West Coast Salmon Fishery
- Abalone Managed Fishery.

Some of the fisheries listed above will be more susceptible to impacts than others, particularly fisheries without the ability to escape impacts. For example, above average water temperatures over the last three years will have had an impact on prawn fisheries in Exmouth (Caputi et al. 2014).

14.7.2. Commonwealth Fisheries

Commonwealth fisheries are those within the 200 nautical mile Australian Fishing Zone (AFZ) managed by Australian Fisheries Management Authority (AFMA) and are, on the high seas, and, in some cases, by agreement with the States and Territory, to the low water mark. Information on Commonwealth managed fisheries has been derived from '*Fishery Status'* Report 2019 (Department of Agriculture 2019)

Commonwealth fisheries who have permits to operate in the EMBA include as shown in **Figure 21**:

- North West Slope Trawl (NWST)
- Western Tuna and Billfish Fishery (WTBF) (including Southern Tuna and Billfish Fishery)
- Skipjack Tuna Fishery (STF) (referred to as Western Skipjack Tuna Fishery in **Figure 21**)
- Western Deepwater Trawl (WDTF) (referred to as Western Deepwater Trawl Fishery in **Figure 21**.

Commonwealth commercial fisheries in the EMBA are shown **Figure 21** and summarised in **Table 20**

Table 20: Commercial fisheries with permits to operate within the EMBA

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
State Managed Fisheries				
Abalone Managed Fishery	Greenlip abalone (*Haliotis laevigata*) Brownlip abalone (*H. conicopora*)	2017/2018: 98 tonnes 2022/2023: Commercial: 40.1t Recreational: 11.6-17.2t	Dive fishery The principal harvest method is a diver working off 'hookah' (surface supplied breathing apparatus) or SCUBA using an abalone 'iron' to prise the shellfish off rocks – both commercial and recreational divers employ this method.	Shallow coastal waters off the south-west and south coasts of Western Australia Covers all Western Australian coastal waters, which are divided into eight management areas. Commercial fishing for greenlip/brownlip abalone is managed in three separate areas.
Exmouth Gulf Prawn Managed Fishery	Western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus* spp.) and banana prawns (*Penaeus merguiensis*).	2017/2018: 713 tonnes 2022/2023: Commercial: 898t	Low opening otter trawls.	Sheltered waters of Exmouth Gulf Essentially the western half of the Exmouth Gulf (eastern part is a nursery ground). The Muiron Islands and Point Murat provide the western boundary; Serrurier Island provides the northern limit
Marine Aquarium Fish Managed Fishery (MAFMF)	Over 250 target species of finfish. (228 species caught in 2012). Fishers can also take coral, live rock, algae, seagrass and invertebrates. The main fish species landed in 2012 were scribbled angelfish (*Chaetodontoplus duboulayi*) and green chromis (*Chromis cinerascens*) The main coral species landed in 2012 were the	2017/2018: Total catch of 150,544 fishes, 21.9 t of coral, live rock & living sand and 322 L of marine plants. 2022: Commercial: total catch 19,710 individuals (fish) 77,287 invertebrates	Hand harvest while diving or wading. Hand held nets	Dive based fishery operating all year throughout WA waters but restricted by diving depths. The MAFMF is able to operate in all State waters (between the Northern Territory border and South Australian border). The fishery is typically more active in waters south of Broome with higher levels of effort around the Capes region, Perth, Geraldton, Exmouth and Dampier. Operators in the MAFMF are also permitted to take coral, live rock, algae, seagrass and invertebrates under the

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
	coral like anemones of the *Corallimorpharia*.			Prohibition on Fishing (Coral, 'Live Rock' and Algae) Order 2007 and by way of Ministerial Exemption (Gaughan & Santoro, 2018).
Nickol Bay Prawn Managed Fishery (NBPMF)	Primarily targets banana prawns (*Penaeus merguiensis*)	2017/2018: 227 t 2022/2023: Commercial: 51 t	Otter trawl	Operates along the western part of the North-West Shelf in coastal shallow waters The boundaries of the NBPMF are 'all the waters of the Indian Ocean and Nickol Bay between 116°45' east longitude and 120° east longitude on the landward side of the 200 m isobath'. The NBPMF incorporates the Nickol Bay, Extended Nickol Bay, Depuch and De Grey size managed fish grounds (State of the Fisheries 2014-15).
Onslow Prawn Managed Fishery (OPMF)	Western king prawns (*Penaeus latisulcatus*), brown tiger prawns (*Penaeus esculentus*), endeavour prawns (*Metapenaeus* spp.)	2017/2018: Negligible (Minimal fishing occurred in 2017) 2022/2023: Commercial: <60 t	Otter trawl	Operates along the western part of the North-West Shelf with most prawning activities concentrated in the shallower water off the mainland. The boundaries of the OPMF are 'all the Western Australian waters between the Exmouth Prawn Fishery and the Nickol Bay prawn fishery east of 114º39.9' on the landward side of the 200 m depth isobath'.
Pilbara Developmental Crab Fishery	Blue Swimmer (*Portunus armatus*) Mud Crab (*Scylla* spp)	2017/2018: 60 t (total number includes Kimberley Developing Mud Crab Fishery) 2022/2023: unspecified	Variety of gear but mostly commercial crab pots (Hourglass traps used in inshore waters from Onslow through to Port Hedland with most commercial and activity occurring in and around Nickol Bay) Recreational fishers use drop nets or scoop nets,	The majority of the commercially and recreationally-fished stocks are concentrated in the coastal embayments and estuaries between Geographe Bay in the south west and Nickol Bay in the north. Crabbing activity along the Pilbara coast is centred largely on the inshore waters from Onslow through to Port Hedland, with most commercial and recreational activity occurring in and around Nickol Bay.

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
			with diving for crabs becoming increasingly popular	
Pilbara Fish Trawl (Interim) Managed Fishery (PFTIMF)	Variety of demersal scalefish including goldband snapper (*Pristipomoides multidens*), red emperor (*Lutjanus sebae*), bluespotted emperor (*Lethrinus punctulatus*), crimson snapper (*Lutjanus erythropterus*), saddletail snapper (*Lutjanus malabaricus*), Rankin cod (*Epinephelus multinotatus*), brownstripe snapper (*Lutjanus vitta*), rosy threadfin bream (*Nemipterus furcosus*), spangled emperor (*Lethrinus nebulosus*) and frypan Moses' snapper (*Argyrops lutjanusspinifer russelli*).	2017/2018: 1,780 t 2022/2023: Commercial: 1784 t	Demersal trawl	The Pilbara Fish Trawl (Interim) Managed Fishery is situated in the Pilbara region in the north west of Australia. It occupies the waters north of latitude 21°35'S and between longitudes 114°9'36"E and 120°E. The Fishery is seaward of the 50 m isobath and landward of the 200 m isobath. The Fishery consists of two zones; Zone 1 in the south west of the Fishery (which is closed to trawling) and Zone 2 in the North, which consists of six management areas.
Pilbara Trap Managed Fishery (PTMF)	Blue-spot emperor (*Lethrinus hutchinsi*), Red snapper (*Lutjanus erythropterus*), Goldband snapper (*Pristipomoides multidens*), Scarlet perch (*Lutjanus malabaricus*), Red emperor (*Lutjanus sebae*), Spangled emperor (*Lethrinus nebulosus*), Rankin cod (*Epinephelus multinotatus*)	2017/2018: 400–600 t 2022/2023: Commercial: 597 t	Use of rectangular traps with single opening and 50 mm x 70 mm rectangular mesh panels. Trap fishing normally targets areas around rocky outcrops and reefs	Permitted to operate within 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.
Pilbara Line Managed Fishery	Variety of demersal scalefish including goldband snapper (*Pristipomoides multidens*), red emperor (*Lutjanus sebae*), bluespotted emperor (*Lethrinus punctulatus*), crimson snapper (*Lutjanus erythropterus*), saddletail snapper (*Lutjanus malabaricus*), Rankin cod (*Epinephelus multinotatus*), brownstripe snapper	2017/2018: 50–115 t 2022/2023: Commercial: 104 t	Line	The Pilbara Trap Managed Fishery lies north of latitude 21°44´ S and between longitudes 114°9´36´´ E and 120° E on the landward side of a boundary approximating the 200 m isobath and seaward of a line generally following the 30 m isobath.

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
	(*Lutjanus vitta*), rosy threadfin bream (*Nemipterus furcosus*), spangled emperor (*Lethrinus nebulosus*) and frypan snapper (*Argyrops spinifer*), Ruby snapper (*Etelis carbunculus*) and eightbar grouper (*Hyporthodus octofasciatus*)			
South West Coast Salmon Managed Fishery	WA salmon (*Arripis truttaceus*)	Insufficient information	Insufficient information	Insufficient information Various beaches south of the metropolitan area.
Specimen Shell Managed Fishery (SSF)	Shells (cowries, cones) The Specimen Shell Managed Fishery (SSF) is based on the collection of individual shells for the purposes of display, collection, cataloguing, classification and sale. Just under 200 (196) different Specimen Shell species were collected in 2012, using a variety of methods.	2017/2018: 7,806 shells 2022/2023: 5,074 shells	Hand harvest while diving or wading along coastal beaches below the high-water mark An exemption method being employed by the fishery is using a remote-controlled underwater vehicle at depths between 60 and 300 m.	Dive based fishery operating all year throughout WA waters but restricted by diving depths. The fishing area includes all Western Australian waters between the high-water mark and the 200 m isobath. While the fishery covers the entire WA coastline, there is some concentration of effort in areas adjacent to population centres such as Broome, Karratha, Exmouth, Shark Bay, metropolitan Perth, Mandurah, the Capes area and Albany.
West Coast Deep Sea Crustacean (Interim) Managed Fishery	Crystal (Snow) crabs (*Chaceon albus*), Giant (King) crabs (*Pseudocarcinus gigas*) and Champagne (Spiny) crabs (*Hypothalassia acerba*).	2017/2018: 164.4 t Commercial: Class A: 123.2 t Class B: 10 t Class C: 0.1 t	Baited pots operated in a longline formation in the shelf edge waters (>150 m)	North of latitude 34° 24' S (Cape Leeuwin) and west of the Northern Territory border on the seaward side of the 150 m isobath out to the extent of the AFZ, mostly in 500 to 800 m of water.
Mackerel Fishery	Spanish mackerel (*Scomberomorus commerson*), grey mackerel (*S. semifasciatus*), with other species from the genera Scomberomorus, Grammatorcynus and Acanthocybium also	2016: Commercial: The commercial catch of Spanish mackerel was 276 t in 2016	Trolling or handline Near-surface trolling gear from vessels in coastal areas	The Fishery extends from the West Coast Bioregion to the WA/NT border, to the 200 nautical mile AFZ with most effort and catches recorded north of Geraldton, especially from the Kimberley and Pilbara coasts of the Northern Bioregion.

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
	contributing to commercial catches.	(Gaughan & Santoro, 2018) 2022/2023: Commercial:197 t Recreational: 89-138 t	around reefs, shoals and headlands. Jig fishing is also used to capture grey mackerel (S.semifasciatus)	Restricted to coastal and shallower waters. Catches are reported separately for three Areas: Area 1 – Kimberley (121º E to WA/NT border) Area 2 -Pilbara (114º E to 121º E) Area 3 – Gascoyne (27º S to 114º E) and West Coast (Cape Leeuwin to 27º S).
Western Australian Pearl Oyster Managed Fishery	Indo- Pacific silver-lipped pearl oyster (*Pinctada maxima*).	2018: 468,573 shells 2022/2023: Commercial: 756,531 shells	Drift diving restricted to shallow diveable depths. The collection of pearl oysters for the Pearl Oyster Managed Fishery is restricted to shallow diving depths below 35 m. Divers are attached to large outrigger booms on a vessel and towed slowly over the pearl oyster beds, harvesting legalised oysters by hand as they are seen.	The fishery is separated into four zones: Pearl Oyster Zone 1: NW Cape (including Exmouth Gulf) to longitude 119°30'E. There are five licensees in this zone. No fishing in this zone since 2008 Pearl Oyster Zone 2: East of Cape Thouin (118°20´ E) and south of latitude 18°14´ S. The 9 licensees in this zone also have full access to Zone 3. This zone is the mainstay of the fishery. Pearl Oyster Zone 3: West of longitude 125°20´ E and north of latitude 18°14´ S. The 2 licensees in this zone also have partial access to Zone 2. Pearl Oyster Zone 4: East of longitude 125°20´ E to the Western Australia/Northern Territory border. Although all licensees have access to this zone, exploratory fishing has shown that stocks in this area are not economically viable. However, pearl farming does occur.
Commonwealth Managed Fisheries				
North West Slope Trawl	Scampi (crayfish): velvet scampi (*Metanephrops velutinus*) and boschmai scampi (*Metanephrops boschmai*). Deepwater prawns (penaeid and carid): pink prawn (*Parapenaeus longirostris*), red prawn (*Aristaeomorpha foliacea*), striped prawn (*Aristeus*	2017-18: 79.7 t (total) 2021/2022: 85.8 t	Demersal crustacean trawl seaward of the 200 m isobath.	Extends from 114° E to approximately 125° E off the WA coast between the 200 m isobath and the outer limit of the Australian Fishing Zone (AFZ).

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
	virilis), giant scarlet prawn (*Aristaeopsis edwardsiana*), red carid prawn (*Heterocarpus woodmasoni*) and white carid prawn (*Heterocarpus sibogae*). Snapper.			
Southern Bluefin Tuna Fishery	Southern bluefin tuna (*Thunnus maccoyii*).	2017-18: 6,159 t 2022: 5,972 t	Purse seine vessels primarily in Great Australian Bight all year round and longline off southern NSW in winter. Around 98% of Australia's SBT quota is taken by 5–10 purse seine vessels fishing for 13–25 kg southern bluefin tuna.	Fishery includes all waters of Australia, out to 200 nm from the coast. No current effort on the North West Shelf, fishing activity is concentrated in the Great Australian Bight and off South-east Australia (Department of Agriculture 2019).
Western Skipjack Tuna Fishery	Skipjack tuna (*Katsuwonus pelamis*)	2017-18: None in either zone No catch since 2008/09 fishing season 9 permits awarded 2021/2022	Purse seine	The Skipjack Tuna Fishery is split into two sectors; east and west. The Western Skipjack Tuna Fishery is located in all Australia waters west of 142° 30' 00°E, out to 200 nm from the coast. There has been no fishing effort in the Skipjack Tuna Fishery since the 2008-09 season, and in that season activity concentrated off South Australia (Department of Agriculture 2019).
Western Tuna and Billfish Fishery	Broadbill swordfish (*Xiphias gladius*), albacore tuna (*Thunnus alalunga)*, striped marlin (*Kajikia audax*), bigeye tuna (*T. obesus)* and yellowfin tuna (*T. albacares*).	2018: 278 t 2022: 139 t	Pelagic, longline, minor line and purse seine.	Extends westward from Cape York Peninsula (142°30' E) off Queensland to 34° S off the WA west coast. It also extends eastward from 34° S off the west coast of WA across the Great Australian Bight to 141° E at the South Australian–Victorian border. In recent years, fishing effort has concentrated off south-west Western Australia and South Australia with no

Fishery	Target Species	Catch[1]	Fishing Method	Area Description
				current effort on the North West Shelf (Department of Agriculture 2019).
Western Deepwater Trawl Fishery	A diverse range of species are caught, ranging from tropical and ruby snappers on the shelf edge to orange roughy *(Hoplostethus atlanticus*), oreo dories and bugs (*Ibacus* spp.) in the deeper temperate waters.	2017-18: 101.9 t 2021/2022: 12 t	Demersal fish trawl seaward of the 200 m isobath.	Its northernmost point is from the boundary of the AFZ to longitude 114° E, and its southernmost point is from the boundary of the AFZ to longitude 115°08' E. Deep water off WA, from the 200 m isobath to the edge of the AFZ.

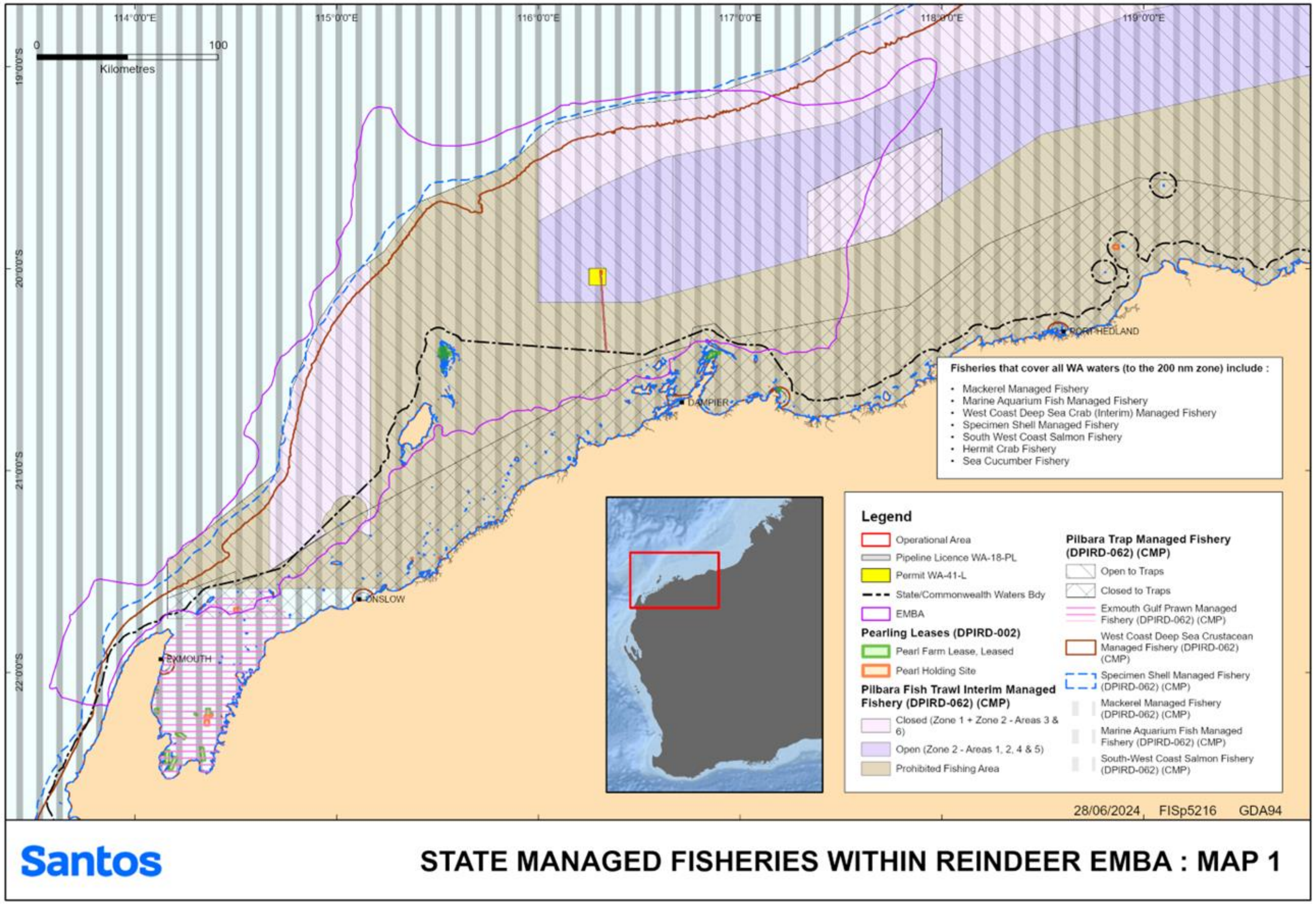


Figure 19: State commercial fisheries within the EMBA and the operational area Map 1

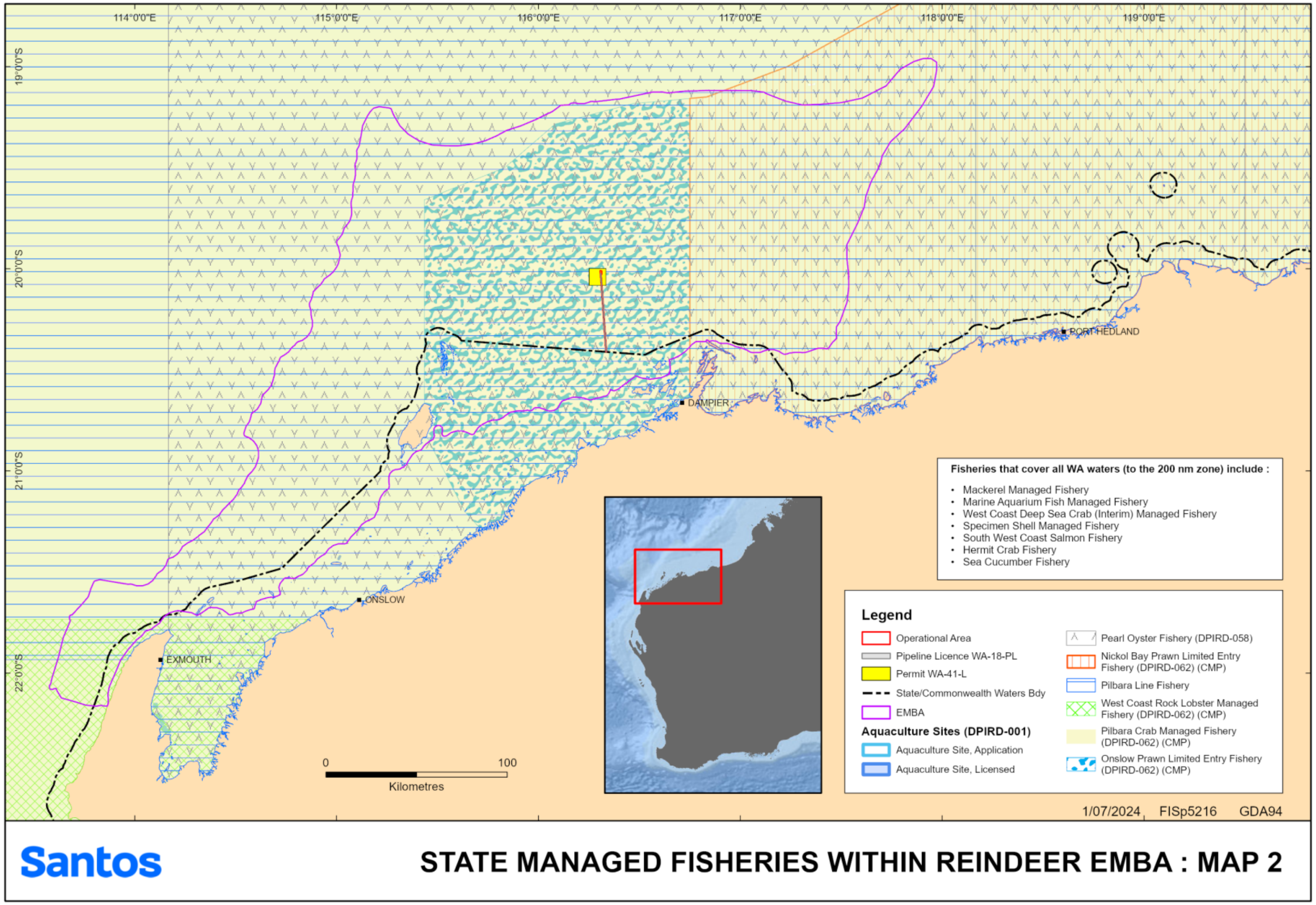


Figure 20: State commercial fisheries within the EMBA and the operational area Map 2

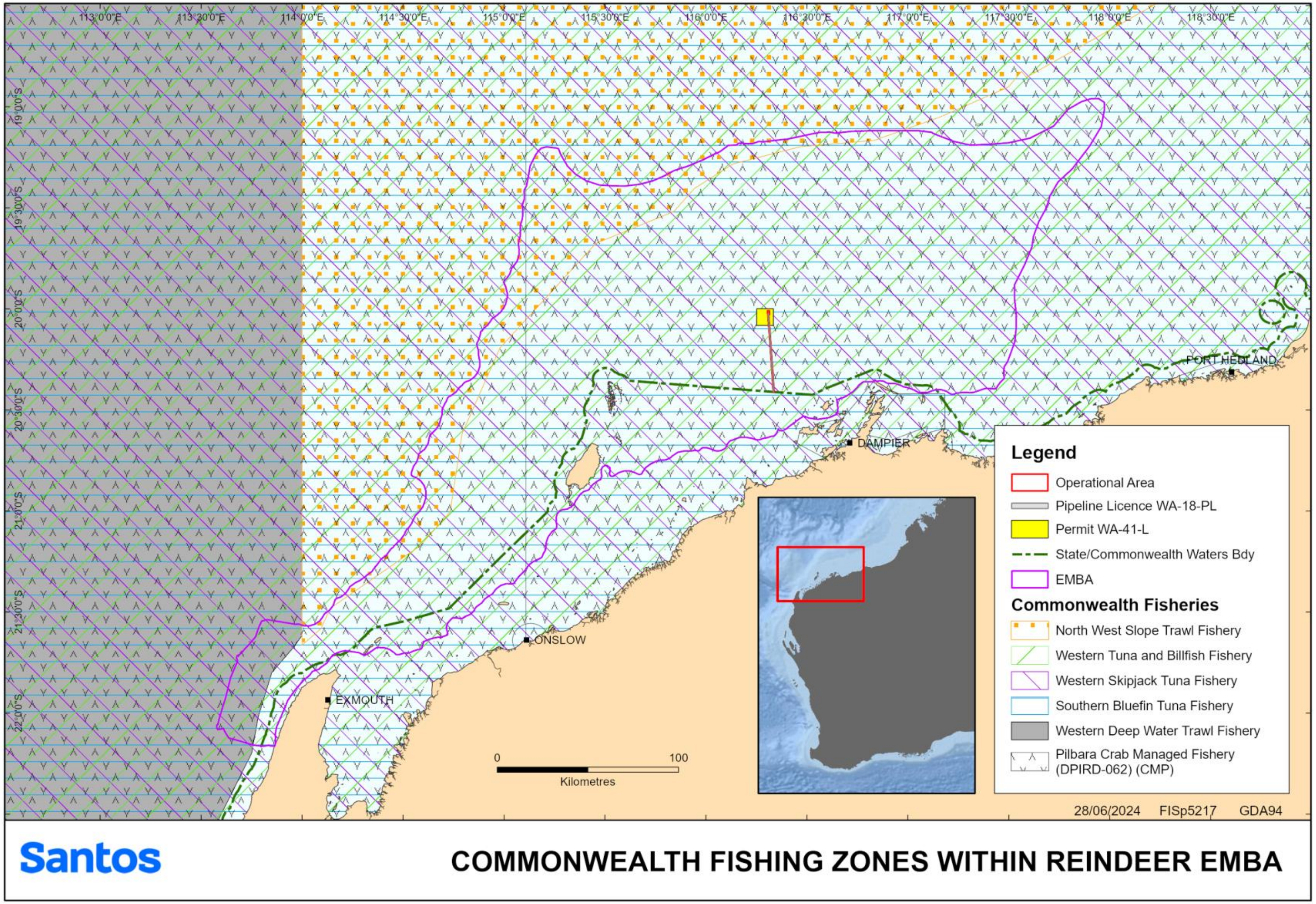


Figure 21: Commonwealth commercial fishing zones within the EMBA

14.8. Aquaculture

14.8.1. Gascoyne Coast Bioregion

Hatchery production of oysters is the core of the pearling industry in the Gascoyne region. Hatcheries in Carnarvon and Exmouth supply spat to pearl farms in the north-west and several hatcheries supply juveniles to the black-lip pearl oyster to developing black pearl farms in the region. Pearl production is carried out on a small scale in Shark Bay and Exmouth Gulf. The local aquiculture sector is also focussing on the production of aquarium species.

14.8.2. North Coast Bioregion

Aquaculture development in this region is dominated by the production of pearls from the species *Pinctada maxima.* Each year, approximately 500,000 wild individuals are harvested, with the majority being from Eighty Mile Bean in Broome, Western Australia (sourced from Fisheries Research and Development Cooperation in Thomas and Miller 2022). A large number of pearl oysters for seeding is obtained from wild stocks and supplemented by hatchery-produced oysters with major hatcheries operating at Broome and the Dampier Peninsular. Pearl farm sites are located mainly along the Kimberley coast, particularly in the Buccaneer Archipelago, in Roebuck Bay and at the Montebello Islands. Developing marine aquaculture initiatives in this region include growing trochus and barramundi. The - Fishery of Western Australia operates in shallow coastal waters (DoF 2006). All the leases are within the 35m diving depth, with commercial diving predominantly occurring in nearshore habitats of 8-15 m depths (sourced from Fisheries Research and Development Cooperation in Thomas and Miller, 2022). Thomas and Miller (2022) demonstrated high levels of gene flow among inshore (8-15 m water depth) and offshore sites (35 m water depth) and no differences in genetic diversity between depths indicating high levels of dispersal and connectivity among inshore and offshore fishing grounds

The Pearl Producer's Association (PPA) assert that spawning stock for pearl oysters occur out to the 100 m depth contour, however, evidence for this is lacking. Condie et al. (2006) modelled oyster larva transport in the Eighty Mile Beach region and found that while some larvae travelled more than 60 km, most were transported less than 30 km. The model results suggested that spawning in the Eighty Mile Beach region is concentrated around the 8 to 15m depth range, with potential smaller contributions from the northeast. These spawning events are likely to lead to successful recruitment locally and alongshore to the southwest.

However, spat abundances seem to be low in these areas, suggesting that recruitment is strongly limited by habitat availability and possibly high mortality rates in shallow water. High local abundances of broodstock and spat observed occasionally in deeper water (<30 m) seem to be supported by intermittent larval transport from inshore populations. Spawning in this area seems to contribute little to recruitment in the inshore populations.

Whalan et al. (2021) used image-based and acoustic methods to elucidate distribution patterns of *P. maxima* off Eighty Mile Beach, including data from 862 km^2 of multibeam survey and 119 towed video transects spanning an area from the 20 to 100 m contour lines. They quantified habitat characters including depth, substrate, and benthic community composition associated with pearl oyster distribution. Multibeam sonar data was also coupled with towed video data to produce predictive statistical models of *P. maxima* habitat. They found *P. maxima* to depths of 76 m, although more than 90 % of individuals occurred shallower than 40 m and less than 2 % were found deeper than 50 m. Oysters occupied flat, sandy habitats with neighbouring benthic communities of filter feeders (>98 % of observations). These results show *P. maxima* predominantly occurs in depths < 40 m, with no evidence that extensive populations extend into deep water in the region.

Further aquaculture in this region mainly focuses on barramundi farming within Cone Bay, with two aquaculture licences granted in this area located about 200 km north-east of Broome (Gaughan and Santoro 2020).

Further aquaculture operations have expanded in the region with the establishment of the Kimberley Aquaculture Development zone, which encompasses almost 2,000 ha of coastal waters within Cone Bay supporting the production of up to 20,000 t of finfish annually (Gaughan and Santoro 2020).

14.9. Recreational Fisheries

14.9.1. Gascoyne Coast Bioregion

The Gascoyne Coast Bioregion extends from just north of Kalbarri to the Ashburton River, south of Onslow. The marine environment of this region represents a transition between the fully tropical waters of the north-west shelf of the north coast region and the temperate waters of the west coast region. This region has been identified as one of the 18 world 'hotspots' in terms of tropical reef endemism and the second most divers marine environment in the world in terms of tropical reef species. This region is a focal point for winter recreational fishing and is a key component of many tourist visits. Angling activities include beach and cliff fishing (e.g. Steep Point and Quobba), embayment and shallow-water boat angling (e.g. Shark Bay, Exmouth Gulf and Ningaloo lagoons), and offshore boat angling for demersal and larger pelagic species (e.g. off Ningaloo). The predominant target species include the tropical species such as emperors, tropical snappers, groupers, mackerels, trevallies and other game fish. Temperate species at the northern end of their ranges such as pink snapper, tailor and whiting also provide significant catches, particularly in Shark Bay (WAFIC 2016).

14.9.2. North Coast Bioregion

The North Coast Bioregion (Pilbara/Kimberley) runs from the Ashburton River to the Western Australia/Northern Territory border (WAFIC 2016). The oceanography of this region includes waters of Pacific Ocean origin that enter through the Indonesian archipelago bringing warm, low salinity waters polewards via the Indonesian throughflow and Holloway currents which flow seasonally and interact with Indian ocean waters. Recreational fishing is experiencing a significant growth in this region, with a distinct seasonal peak in winter when the local population increases by significant numbers of metropolitan and inter-state tourists. This has been added to by the increased recreational fishing by those involved in the construction or operation of major developments in this region. Owing to the high tidal range, much of the angling activity is boat-based with beach fishing limited to periods of flood tides and high water. Numerous creek systems, mangroves, rivers and ocean beaches provide shore and small boat fishing for a variety of species including barramundi, tropical emperors, mangrove jack, trevallies, sooty grunter, threadfin, mud crabs and cods. Offshore islands, coral reef systems and continental shelf waters provide species of major recreational interest including saddletail snapper and red emperor, cods, coral and coronation trout, sharks, trevally, tuskfish, mackerels and billfish (WAFIC 2016).

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Appendix D Protected Matter Search Tool Reports

It is noted that there are three PMST Searches:

- The first is the Reindeer operational area within Commonwealth waters (hence no land is shown on the figure within the PMST output from DCCEEW).
- The second is the Reindeer MEVA.
- The third is the Reindeer EMBA.

The searches are completed using the exact coordinates that are used to produce the figures throughout Section 3 of the EP, ensuring that the EMBA encompasses the full range of environmental receptors that might be contacted by surface and subsurface hydrocarbons at the low exposure level in the highly unlikely event of a worst case oil spill.

The coordinates are also provided within the PMST report to allow for duplication of the search and verification if required.

Santos do not have control over the PMST search tool output, but instead have provided the reports and coordinates to ensure transparency.

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 07-Feb-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	25
Listed Migratory Species:	40

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	73
Whales and Other Cetaceans:	16
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	12
Key Ecological Features (Marine):	None
Biologically Important Areas:	10
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
FISH		
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	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 may occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama		
Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation known to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata		
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may 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 may occur within area

Scientific Name	Threatened Category	Presence Text
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptile		
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
Aipysurus mosaicus as Aipysurus eydouxii Mosaic Sea Snake [87261]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Congregation or aggregation known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Congregation or aggregation known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Congregation or aggregation known to occur within area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis platurus as Pelamis platurus Yellow-bellied Sea Snake [93517]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may 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 may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area

Current Scientific Name	Status	Type of Presence
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Habitat Critical to the Survival of Marine Turtles

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Nov - May		

Scientific Name	Behaviour	Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Not controlled action			
Drilling of an exploration well Gats-1 in Permit Area WA-261-P	2004/1701	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stag Off-bottom Cable Seismic Survey	2007/3696	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a 3D marine seismic survey	2010/5695	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval

Biologically Important Areas

Scientific Name	Behaviour	Presence
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Sharks		

Scientific Name	Behaviour	Presence
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 08-Apr-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	41
Listed Migratory Species:	59

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	96
Whales and Other Cetaceans:	30
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	4
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

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

State and Territory Reserves:	9
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	91
Key Ecological Features (Marine):	4
Biologically Important Areas:	25
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
FISH		
Milyeringa veritas Cape Range Cave Gudgeon, Blind Gudgeon [66676]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis		
Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus		
Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies		
Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Translocated population known to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Isoodon auratus barrowensis		
Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus		
Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Translocated population known to occur within area
Lagorchestes hirsutus Central Australian subspecies		
Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Macroderma gigas		
Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Pilbara Olive Python [66699]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	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	Breeding likely 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
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum		
Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus		
Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
[Limosa lapponica]		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Numenius madagascariensis]		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
[Pandion haliaetus]		
Osprey [952]		Breeding known to occur within area
[Thalasseus bergii]		
Greater Crested Tern [83000]		Breeding known to occur within area
[Tringa nebularia]		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna pacifica as Puffinus pacificus		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat likely to occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon		
Dugong [28]		Species or species habitat known to occur within area
Reptile		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii		
Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
Aipysurus foliosquama		
Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis		
Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
Aipysurus mosaicus as Aipysurus eydouxii		
Mosaic Sea Snake [87261]		Species or species habitat may occur within area
Aipysurus tenuis		
Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	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	Breeding likely to occur within area

Scientific Name	Threatened Category	Presence Text
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat likely 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

Current Scientific Name	Status	Type of Presence
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa sahulensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks	[Resource Information]
Park Name	Zone & IUCN Categories
Dampier	Habitat Protection Zone (IUCN IV)
Dampier	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Dampier	National Park Zone (IUCN II)

Habitat Critical to the Survival of Marine Turtles		[Resource Information]
Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Barrow Island	Marine Management Area	WA
Boodie, Double Middle Islands	Nature Reserve	WA
Lowendal Islands	Nature Reserve	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Marine Park	WA
Montebello Islands	Conservation Park	WA
Unnamed WA36915	Nature Reserve	WA
Unnamed WA40828	5(1)(h) Reserve	WA
Unnamed WA40877	5(1)(h) Reserve	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Browse to North West Shelf Development, Indian Ocean, WA	2018/8319		Approval
Gorgon Gas Development	2003/1294		Post-Approval
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335		Approval
Controlled action			
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Development of Angel gas and condensate field, North West Shelf	2004/1805	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Light Crude Oil Production	2001/365	Controlled Action	Post-Approval
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Simpson Development	2000/59	Controlled Action	Completed
Simpson Oil Field Development	2001/227	Controlled Action	Post-Approval
Not controlled action			
'Goodwyn A' Low Pressure Train Project	2003/914	Not Controlled Action	Completed
Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for	2004/1703	Not Controlled Action	Completed
Development of Halyard Field off the west coast of WA	2010/5611	Not Controlled Action	Completed
Drilling of an exploration well Gats-1 in Permit Area WA-261-P	2004/1701	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Extension of Simpson Oil Platforms & Wells	2002/685	Not Controlled Action	Completed
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Infill Production Well (Griffin-9)	2001/417	Not Controlled Action	Completed
Klammer 2D Seismic Survey	2002/868	Not Controlled Action	Completed
Maia-Gaea Exploration wells	2000/17	Not Controlled Action	Completed
Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA	2014/7160	Not Controlled Action	Completed
North Rankin B gas compression facility	2005/2500	Not Controlled Action	Completed
Pipeline System Modifications Project	2000/3	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Searipple gas and condensate field development	2000/89	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
sub-sea tieback of Perseus field wells	2004/1326	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Western Flank Gas Development	2005/2464	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km	2005/2037	Not Controlled Action (Particular Manner)	Post-Approval
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey Permit Area WA-352-P	2008/4628	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA	2013/6901	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey in the Carnarvon Bsin on the North West Shelf	2002/778	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Consturction & operation of the Varanus Island kitchen & mess cyclone refuge building, compression p	2013/6952	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval
Decommissioning of the Legendre facilities	2010/5681	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval
Draeck 3D Marine Seismic Survey, WA-205-P	2006/3067	Not Controlled Action (Particular Manner)	Post-Approval
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Earthworks for kitchen/mess, cyclone refuge building & Compression Plant, Varanus Island	2013/6900	Not Controlled Action (Particular Manner)	Post-Approval
Eendracht Multi-Client 3D Marine Seismic Survey	2009/4749	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Greater Western Flank Phase 1 gas Development	2011/5980	Not Controlled Action (Particular Manner)	Post-Approval
Grimalkin 3D Seismic Survey	2008/4523	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval
John Ross & Rosella Off Bottom Cable Seismic Exploration Program	2008/3966	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular Manner)	Post-Approval
Orcus 3D Marine Seismic Survey in WA-450-P	2010/5723	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P	2010/5472	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stag Off-bottom Cable Seismic Survey	2007/3696	Not Controlled Action (Particular Manner)	Post-Approval
Tidepole Maz 3D Seismic Survey Campaign	2007/3706	Not Controlled Action (Particular Manner)	Post-Approval
Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R	2006/2609	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Undertake a 3D marine seismic survey	2010/5695	Not Controlled Action (Particular Manner)	Post-Approval
Warramunga Non-Inclusive 3D Seismic Survey	2008/4553	Not Controlled Action (Particular Manner)	Post-Approval
West Anchor 3D Marine Seismic Survey	2008/4507	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA	2013/7078	Referral Decision	Completed
Varanus Island Compression Project	2012/6698	Referral Decision	Completed

Key Ecological Features [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west

Name	Region
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Continental Slope Demersal Fish Communities	North-west
Glomar Shoals	North-west

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur
Chelonia mydas Green Turtle [1765]	Basking	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Mating	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur

Scientific Name	Behaviour	Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Mating	Known to occur
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur

Scientific Name	Behaviour	Presence
Megaptera novaeangliae		
Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements
This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 20-Mar-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	52
Listed Migratory Species:	61

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	1
Listed Marine Species:	102
Whales and Other Cetaceans:	30
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	6
Habitat Critical to the Survival of Marine Turtles:	4

Extra Information

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

State and Territory Reserves:	23
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	168
Key Ecological Features (Marine):	5
Biologically Important Areas:	37
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Legal Status
The Ningaloo Coast	WA	Declared property

National Heritage Places [Resource Information]

Name	State	Legal Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name
Commonwealth Marine Areas (EPBC Act)
Commonwealth Marine Areas (EPBC Act)

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
FISH		
Milyeringa veritas Cape Range Cave Gudgeon, Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Breeding known to occur within area
MAMMAL		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Osphranter robustus isabellinus Barrow Island Wallaroo, Barrow Island Euro [89262]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis lateralis Black-flanked Rock-wallaby, Moororong, Black-footed Rock Wallaby [66647]	Endangered	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
REPTILE		

Scientific Name	Threatened Category	Presence Text
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus zastictus Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat 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	Breeding known to occur within area
Liasis olivaceus barroni Pilbara Olive Python [66699]	Vulnerable	Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat likely to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely 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]

Scientific Name	Threatened Category	Presence Text
Bird		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalasseus bengalensis as Sterna bengalensis Lesser Crested Tern [66546]		Breeding known to occur within area
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area
Fish		

Scientific Name	Threatened Category	Presence Text
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Trachyrhamphus bicoarctatus		
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris		
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammal		
Dugong dugon		
Dugong [28]		Breeding known to occur within area
Reptile		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii		
Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area
Aipysurus foliosquama		
Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis		
Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
Aipysurus mosaicus as Aipysurus eydouxii		
Mosaic Sea Snake [87261]		Species or species habitat may occur within area
Aipysurus tenuis		
Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area

Scientific Name	Threatened Category	Presence Text
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Whales and Other Cetaceans

[Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
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

Current Scientific Name	Status	Type of Presence
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia sima Dwarf Sperm Whale [85043]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
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 sahulensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area

Current Scientific Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories
Dampier	Habitat Protection Zone (IUCN IV)
Dampier	Multiple Use Zone (IUCN VI)
Gascoyne	Multiple Use Zone (IUCN VI)
Montebello	Multiple Use Zone (IUCN VI)
Dampier	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)

Habitat Critical to the Survival of Marine Turtles [Resource Information]

Scientific Name	Behaviour	Presence
Aug - Sep		
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Dec - Jan		
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Nov-Feb		
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur
Nov - May		
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Barrow Island	Nature Reserve	WA
Barrow Island	Marine Management Area	WA
Barrow Island	Marine Park	WA
Bessieres Island	Nature Reserve	WA
Boodie, Double Middle Islands	Nature Reserve	WA
Cape Range	National Park	WA
Jurabi Coastal Park	5(1)(h) Reserve	WA
Lowendal Islands	Nature Reserve	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Conservation Park	WA
Montebello Islands	Marine Park	WA
Muiron Islands	Nature Reserve	WA
Muiron Islands	Marine Management Area	WA
Ningaloo	Marine Park	WA
Serrurier Island	Nature Reserve	WA
Unnamed WA36909	5(1)(h) Reserve	WA
Unnamed WA36910	5(1)(h) Reserve	WA
Unnamed WA36913	Nature Reserve	WA
Unnamed WA36915	Nature Reserve	WA
Unnamed WA40828	5(1)(h) Reserve	WA
Unnamed WA40877	5(1)(h) Reserve	WA
Unnamed WA41080	5(1)(h) Reserve	WA
Unnamed WA44665	5(1)(h) Reserve	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Browse to North West Shelf Development, Indian Ocean, WA	2018/8319		Approval
Gorgon Gas Development	2003/1294		Post-Approval
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335		Approval
Project Highclere Cable Lay and Operation	2022/09203		Completed
Action clearly unacceptable			
Highlands 3D Marine Seismic Survey	2012/6680	Action Clearly Unacceptable	Completed
Controlled action			
'Van Gogh' Petroleum Field Development	2007/3213	Controlled Action	Post-Approval
Anketell Point Iron Ore Processing & Export Port	2009/5120	Controlled Action	Post-Approval
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatston	2008/4469	Controlled Action	Post-Approval
Develop Jansz-Io deepwater gas field in Permit Areas WA-18-R, WA-25-R and WA-26-	2005/2184	Controlled Action	Post-Approval
Development of Angel gas and condensate field, North West Shelf	2004/1805	Controlled Action	Post-Approval
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed
Development of Coniston/Novara fields within the Exmouth Sub-basin	2011/5995	Controlled Action	Post-Approval
Development of Stybarrow petroleum field incl drilling and facility installation	2004/1469	Controlled Action	Post-Approval
Echo-Yodel Production Wells	2000/11	Controlled Action	Post-Approval
Enfield full field development	2001/257	Controlled Action	Post-Approval
Equus Gas Fields Development Project, Carnarvon Basin	2012/6301	Controlled Action	Completed
Eramurra Industrial Salt Project	2021/9027	Controlled Action	Assessment Approach

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Gorgon Gas Development 4th Train Proposal	2011/5942	Controlled Action	Post-Approval
Gorgon Gas Revised Development	2008/4178	Controlled Action	Post-Approval
Greater Enfield (Vincent) Development	2005/2110	Controlled Action	Post-Approval
Greater Gorgon Development - Optical Fibre Cable, Mainland to Barrow Island	2005/2141	Controlled Action	Completed
Light Crude Oil Production	2001/365	Controlled Action	Post-Approval
Pluto Gas Project	2005/2258	Controlled Action	Completed
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval
Pyrenees Oil Fields Development	2005/2034	Controlled Action	Post-Approval
Simpson Development	2000/59	Controlled Action	Completed
Simpson Oil Field Development	2001/227	Controlled Action	Post-Approval
Vincent Appraisal Well	2000/22	Controlled Action	Post-Approval
Not controlled action			
'Goodwyn A' Low Pressure Train Project	2003/914	Not Controlled Action	Completed
'Van Gogh' Oil Appraisal Drilling Program, Exploration Permit Area WA-155-P(1)	2006/3148	Not Controlled Action	Completed
Barrow Island 2D Seismic survey	2006/2667	Not Controlled Action	Completed
Bultaco-2, Laverda-2, Laverda-3 and Montesa-2 Appraisal Wells	2000/103	Not Controlled Action	Completed
Carnarvon 3D Marine Seismic Survey	2004/1890	Not Controlled Action	Completed
Construction and operation of an unmanned sea platform and connecting pipeline to Varanus Island for	2004/1703	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Development of Halyard Field off the west coast of WA	2010/5611	Not Controlled Action	Completed
Development of Mutineer and Exeter petroleum fields for oil production, Permit	2003/1033	Not Controlled Action	Completed
Drilling of an exploration well Gats-1 in Permit Area WA-261-P	2004/1701	Not Controlled Action	Completed
Eagle-1 Exploration Drilling, North West Shelf, WA	2019/8578	Not Controlled Action	Completed
Echo A Development WA-23-L, WA-24-L	2005/2042	Not Controlled Action	Completed
Exploration drilling well WA-155-P(1)	2003/971	Not Controlled Action	Completed
Exploration of appraisal wells	2006/3065	Not Controlled Action	Completed
Exploration Well in Permit Area WA-155-P(1)	2002/759	Not Controlled Action	Completed
Exploratory drilling in permit area WA-225-P	2001/490	Not Controlled Action	Completed
Extension of Simpson Oil Platforms & Wells	2002/685	Not Controlled Action	Completed
HCA05X Macedon Experimental Survey	2004/1926	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Infill Production Well (Griffin-9)	2001/417	Not Controlled Action	Completed
Klammer 2D Seismic Survey	2002/868	Not Controlled Action	Completed
Maia-Gaea Exploration wells	2000/17	Not Controlled Action	Completed
Montesa-1 and Bultaco-1 Exploration Wells	2000/102	Not Controlled Action	Completed
Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA	2014/7160	Not Controlled Action	Completed
North Rankin B gas compression facility	2005/2500	Not Controlled Action	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Pipeline System Modifications Project	2000/3	Not Controlled Action	Completed
Project Highclere Geophysical Survey	2021/9023	Not Controlled Action	Completed
Searipple gas and condensate field development	2000/89	Not Controlled Action	Completed
Spool Base Facility	2001/263	Not Controlled Action	Completed
Subsea Gas Pipeline From Stybarrow Field to Griffin Venture Gas Export Pipeline	2005/2033	Not Controlled Action	Completed
sub-sea tieback of Perseus field wells	2004/1326	Not Controlled Action	Completed
Telstra North Rankin Spur Fibre Optic Cable	2016/7836	Not Controlled Action	Completed
Thevenard Island Retirement Project	2015/7423	Not Controlled Action	Completed
To construct and operate an offshore submarine fibre optic cable, WA	2014/7373	Not Controlled Action	Completed
Wanda Offshore Research Project, 80 km north-east of Exmouth, WA	2018/8293	Not Controlled Action	Completed
Western Flank Gas Development	2005/2464	Not Controlled Action	Completed
Wheatstone 3D seismic survey, 70km north of Barrow Island	2004/1761	Not Controlled Action	Completed
Not controlled action (particular manner)			
'Kate' 3D marine seismic survey, exploration permits WA-320-P and WA-345-P, 60km	2005/2037	Not Controlled Action (Particular Manner)	Post-Approval
'Tourmaline' 2D marine seismic survey, permit areas WA-323-P, WA-330-P and WA-32	2005/2282	Not Controlled Action (Particular Manner)	Post-Approval
"Leanne" offshore 3D seismic exploration, WA-356-P	2005/1938	Not Controlled Action (Particular Manner)	Post-Approval
2D and 3D seismic surveys	2005/2151	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval
2D Seismic Survey Permit Area WA-352-P	2008/4628	Not Controlled Action (Particular Manner)	Post-Approval
2D seismic survey within permit WA-291	2007/3265	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in Permit Areas WA-15-R, WA-18-R, WA-205-P, WA-253-P, WA-267-P and WA-268-P	2003/1271	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Survey in WA 457-P & WA 458-P, North West Shelf, offshore WA	2013/6862	Not Controlled Action (Particular Manner)	Post-Approval
3D Marine Seismic Surveys - Contos CT-13 & Supertubes CT-13, offshore WA	2013/6901	Not Controlled Action (Particular Manner)	Post-Approval
3D seismic survey	2006/2715	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey, WA	2008/4428	Not Controlled Action (Particular Manner)	Post-Approval
3D Seismic Survey in the Carnarvon Bsin on the North West Shelf	2002/778	Not Controlled Action (Particular Manner)	Post-Approval
3D sesmic survey	2006/2781	Not Controlled Action (Particular Manner)	Post-Approval
Apache Northwest Shelf Van Gogh Field Appraisal Drilling Program	2007/3495	Not Controlled Action (Particular Manner)	Post-Approval
Aperio 3D Marine Seismic Survey, WA	2012/6648	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Artemis-1 Drilling Program (WA-360-P)	2010/5432	Not Controlled Action (Particular Manner)	Post-Approval
Babylon 3D Marine Seismic Survey, Commonwealth Waters, nr Exmouth WA	2013/7081	Not Controlled Action (Particular Manner)	Post-Approval
Balnaves Condensate Field Development	2011/6188	Not Controlled Action (Particular Manner)	Post-Approval
Cable Seismic Exploration Permit areas WA-323-P and WA-330-P	2008/4227	Not Controlled Action (Particular Manner)	Post-Approval
Cerberus exploration drilling campaign, Carnarvon Basin, WA	2016/7645	Not Controlled Action (Particular Manner)	Post-Approval
CGGVERITAS 2010 2D Seismic Survey	2010/5714	Not Controlled Action (Particular Manner)	Post-Approval
Charon 3D Marine Seismic Survey	2007/3477	Not Controlled Action (Particular Manner)	Post-Approval
Consturction & operation of the Varanus Island kitchen & mess cyclone refuge building, compression p	2013/6952	Not Controlled Action (Particular Manner)	Post-Approval
Cue Seismic Survey within WA-359-P, WA-361-P and WA-360-P	2007/3647	Not Controlled Action (Particular Manner)	Post-Approval
CVG 3D Marine Seismic Survey	2012/6654	Not Controlled Action (Particular Manner)	Post-Approval
DAVROS MC 3D marine seismic survey northwaet of Dampier, WA	2013/7092	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Decommissioning of the Legendre facilities	2010/5681	Not Controlled Action (Particular Manner)	Post-Approval
Deep Water Northwest Shelf 2D Seismic Survey	2007/3260	Not Controlled Action (Particular Manner)	Post-Approval
Demeter 3D Seismic Survey, off Dampier, WA	2002/900	Not Controlled Action (Particular Manner)	Post-Approval
Draeck 3D Marine Seismic Survey, WA-205-P	2006/3067	Not Controlled Action (Particular Manner)	Post-Approval
Drilling 35-40 offshore exploration wells in deep water	2008/4461	Not Controlled Action (Particular Manner)	Post-Approval
Earthworks for kitchen/mess, cyclone refuge building & Compression Plant, Varanus Island	2013/6900	Not Controlled Action (Particular Manner)	Post-Approval
Eendracht Multi-Client 3D Marine Seismic Survey	2009/4749	Not Controlled Action (Particular Manner)	Post-Approval
Effect of marine seismic sounds to demersal fish and pearl oysters, north-west WA	2018/8169	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M3 & Vincent 4D Marine Seismic Surveys	2008/3981	Not Controlled Action (Particular Manner)	Completed
Enfield M3 4D, Vincent 4D & 4D Line Test Marine Seismic Surveys	2008/4122	Not Controlled Action (Particular Manner)	Post-Approval
Enfield M4 4D Marine Seismic Survey	2008/4558	Not Controlled Action (Particular Manner)	Post-Approval
Enfield oilfield 3D Seismic Survey	2006/3132	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Exploration drilling of Zeus-1 well	2008/4351	Not Controlled Action (Particular Manner)	Post-Approval
Fletcher-Finucane Development, WA26-L and WA191-P	2011/6123	Not Controlled Action (Particular Manner)	Post-Approval
Foxhound 3D Non-Exclusive Marine Seismic Survey	2009/4703	Not Controlled Action (Particular Manner)	Post-Approval
Gazelle 3D Marine Seismic Survey in WA-399-P and WA-42-L	2010/5570	Not Controlled Action (Particular Manner)	Post-Approval
Greater Western Flank Phase 1 gas Development	2011/5980	Not Controlled Action (Particular Manner)	Post-Approval
Grimalkin 3D Seismic Survey	2008/4523	Not Controlled Action (Particular Manner)	Post-Approval
Guacamole 2D Marine Seismic Survey	2008/4381	Not Controlled Action (Particular Manner)	Post-Approval
Harmony 3D Marine Seismic Survey	2012/6699	Not Controlled Action (Particular Manner)	Post-Approval
Harpy 1 exploration well	2001/183	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas MC3D Marine Seismic Survey (HZ-13) Carnarvon Basin, offshore WA	2013/7003	Not Controlled Action (Particular Manner)	Post-Approval
Huzzas phase 2 marine seismic survey, Exmouth Plateau, Northern Carnarvon Basin, WA	2013/7093	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
John Ross & Rosella Off Bottom Cable Seismic Exploration Program	2008/3966	Not Controlled Action (Particular Manner)	Post-Approval
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2008/4630	Not Controlled Action (Particular Manner)	Post-Approval
Judo Marine 3D Seismic Survey within and adjacent to WA-412-P	2009/4801	Not Controlled Action (Particular Manner)	Post-Approval
Julimar Brunello Gas Development Project	2011/5936	Not Controlled Action (Particular Manner)	Post-Approval
Klimt 2D Marine Seismic Survey	2007/3856	Not Controlled Action (Particular Manner)	Post-Approval
Laverda 3D Marine Seismic Survey and Vincent M1 4D Marine Seismic Survey	2010/5415	Not Controlled Action (Particular Manner)	Post-Approval
Macedon Gas Field Development	2008/4605	Not Controlled Action (Particular Manner)	Post-Approval
Marine reconnaissance survey	2008/4466	Not Controlled Action (Particular Manner)	Post-Approval
Moosehead 2D seismic survey within permit WA-192-P	2005/2167	Not Controlled Action (Particular Manner)	Post-Approval
Munmorah 2D seismic survey within permits WA-308/9-P	2003/970	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Program, WA-264-P	2007/3844	Not Controlled Action (Particular Manner)	Post-Approval
Ocean Bottom Cable Seismic Survey	2005/2017	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Offshore Canning Multi Client 2D Marine Seismic Survey	2010/5393	Not Controlled Action (Particular Manner)	Post-Approval
Offshore Drilling Campaign	2011/5830	Not Controlled Action (Particular Manner)	Post-Approval
Orcus 3D Marine Seismic Survey in WA-450-P	2010/5723	Not Controlled Action (Particular Manner)	Post-Approval
Osprey and Dionysus Marine Seismic Survey	2011/6215	Not Controlled Action (Particular Manner)	Post-Approval
Pomodoro 3D Marine Seismic Survey in WA-426-P and WA-427-P	2010/5472	Not Controlled Action (Particular Manner)	Post-Approval
Port Walcott upgrade, dredging & spoil disposal, & channel realignment	2006/2806	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees 4D Marine Seismic Monitor Survey, HCA12A	2012/6579	Not Controlled Action (Particular Manner)	Post-Approval
Pyrenees-Macedon 3D marine seismic survey	2005/2325	Not Controlled Action (Particular Manner)	Post-Approval
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval
Rose 3D Seismic Program	2008/4239	Not Controlled Action (Particular Manner)	Post-Approval
Salsa 3D Marine Seismic Survey	2010/5629	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
Santos Winchester three dimensional seismic survey - WA-323-P & WA-330-P	2011/6107	Not Controlled Action (Particular Manner)	Post-Approval
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval
Skorpion Marine Seismic Survey WA	2001/416	Not Controlled Action (Particular Manner)	Post-Approval
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval
Stag Off-bottom Cable Seismic Survey	2007/3696	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow 4D Marine Seismic Survey	2011/5810	Not Controlled Action (Particular Manner)	Post-Approval
Stybarrow Baseline 4D marine seismic survey	2008/4530	Not Controlled Action (Particular Manner)	Post-Approval
Tantabiddi Boat Ramp Sand Bypassing	2015/7411	Not Controlled Action (Particular Manner)	Post-Approval
Tidepole Maz 3D Seismic Survey Campaign	2007/3706	Not Controlled Action (Particular Manner)	Post-Approval
Tortilla 2D Seismic Survey, WA	2011/6110	Not Controlled Action (Particular Manner)	Post-Approval
Triton 3D Marine Seismic Survey, WA-2-R and WA-3-R	2006/2609	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a 3D marine seismic survey	2010/5695	Not Controlled Action (Particular	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
		Manner)	
Undertake a three dimensional marine seismic survey	2010/5715	Not Controlled Action (Particular Manner)	Post-Approval
Undertake a three dimensional marine seismic survey	2010/5679	Not Controlled Action (Particular Manner)	Post-Approval
Vincent M1 and Enfield M5 4D Marine Seismic Survey	2010/5720	Not Controlled Action (Particular Manner)	Post-Approval
Warramunga Non-Inclusive 3D Seismic Survey	2008/4553	Not Controlled Action (Particular Manner)	Post-Approval
West Anchor 3D Marine Seismic Survey	2008/4507	Not Controlled Action (Particular Manner)	Post-Approval
West Panaeus 3D seismic survey	2006/3141	Not Controlled Action (Particular Manner)	Post-Approval
Westralia SPAN Marine Seismic Survey, WA & NT	2012/6463	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone 3D MAZ Marine Seismic Survey	2011/6058	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2007/3941	Not Controlled Action (Particular Manner)	Post-Approval
Wheatstone Iago Appraisal Well Drilling	2008/4134	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
3D Marine Seismic Survey in the offshore northwest Carnarvon Basin	2011/6175	Referral Decision	Completed

Title of referral	Reference	Referral Outcome	Assessment Status
Referral decision			
3D Seismic Survey	2008/4219	Referral Decision	Completed
Bianchi 3D Marine Seismic Survey, Carnavon Basin, WA	2013/7078	Referral Decision	Completed
CVG 3D Marine Seismic Survey	2012/6270	Referral Decision	Completed
Enfield 4D Marine Seismic Surveys, Production Permit WA-28-L	2005/2370	Referral Decision	Completed
Rose 3D Seismic acquisition survey	2008/4220	Referral Decision	Completed
Stybarrow Baseline 4D Marine Seismic Survey (Permit Areas WA-255-P, WA-32-L, WA-	2008/4165	Referral Decision	Completed
Two Dimensional Transition Zone Seismic Survey - TP/7 (R1)	2010/5507	Referral Decision	Completed
Varanus Island Compression Project	2012/6698	Referral Decision	Completed

Key Ecological Features [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Glomar Shoals	North-west

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence
Dugong		
Dugong dugon Dugong [28]	Breeding	Known to occur
Dugong dugon Dugong [28]	Calving	Known to occur

Scientific Name	Behaviour	Presence
Dugong dugon Dugong [28]	Foraging (high density seagrass beds)	Known to occur
Dugong dugon Dugong [28]	Nursing	Known to occur
Marine Turtles		
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur
Chelonia mydas Green Turtle [1765]	Aggregation	Known to occur
Chelonia mydas Green Turtle [1765]	Basking	Known to occur
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur
Chelonia mydas Green Turtle [1765]	Mating	Known to occur
Chelonia mydas Green Turtle [1765]	Migration corridor	Known to occur
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Migration corridor	Known to occur
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur
Natator depressus Flatback Turtle [59257]	Aggregation	Known to occur
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur
Natator depressus Flatback Turtle [59257]	Mating	Known to occur
Natator depressus Flatback Turtle [59257]	Migration corridor	Known to occur
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur

Scientific Name	Behaviour	Presence
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Thalasseus bengalensis Lesser Crested Tern [66546]	Breeding	Known to occur
Sharks		
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur
Rhincodon typus Whale Shark [66680]	Foraging (high density prey)	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix E Aboriginal Cultural Heritage Enquiry System

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

Search Criteria

1 Aboriginal Cultural Heritage (ACH) Register in Shapefile - ENVIRON_OFSHR_OPERATIONAL_AREAS

Disclaimer

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific, or aesthetic importance within Aboriginal traditions, and provides an essential link for Aboriginal people to their past, present and future. In Western Australia Aboriginal heritage is protected under the *Aboriginal Heritage Act 1972*.

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Copyright

Terminology

ID: ACH on the Register is assigned a unique ID by the Department of Planning, Lands and Heritage using the format: ACH-00000001. For ACH on the former Register the ID numbers remain unchanged and use the new format. For example the ACH ID of the place Swan River was previously '3536' and is now 'ACH-00003536'.

Access and Restrictions:

- **Boundary Reliable (Yes/No):** Indicates whether to the best knowledge of the Department, the location and extent of the ACH boundary is considered reliable.
- **Boundary Restricted = No:** Represents the actual location of the ACH as understood by the Department..
- **Boundary Restricted = Yes:** To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least 4km²) provides a general indication of where the ACH is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- **Culturally Sensitive = No:** Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- **Culturally Sensitive = Yes:** Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form.
- **Culturally Sensitive Nature:**
    - **No Gender / Initiation Restrictions:** *Anyone* can view the information.
    - **Men only:** Only *males* can view restricted information.
    - **Women only:** Only *females* can view restricted information.

Status:

- **Register:** Aboriginal cultural heritage places that are assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- **Lodged:** Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the *Aboriginal Heritage Act 1972.*
- **Historic:** Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the *Aboriginal Heritage Act 1972*. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.
Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

Coordinates

Map coordinates are based on the GDA 94 Datum.

Basemap Copyright

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Register

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
11816	DEVIL CREEK, MARDIE STATION	Yes	No	Yes	Men only	Register	Engraving; Grinding areas / Grooves	*Registered Knowledge Holder names available from DPLH	P00360

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Register

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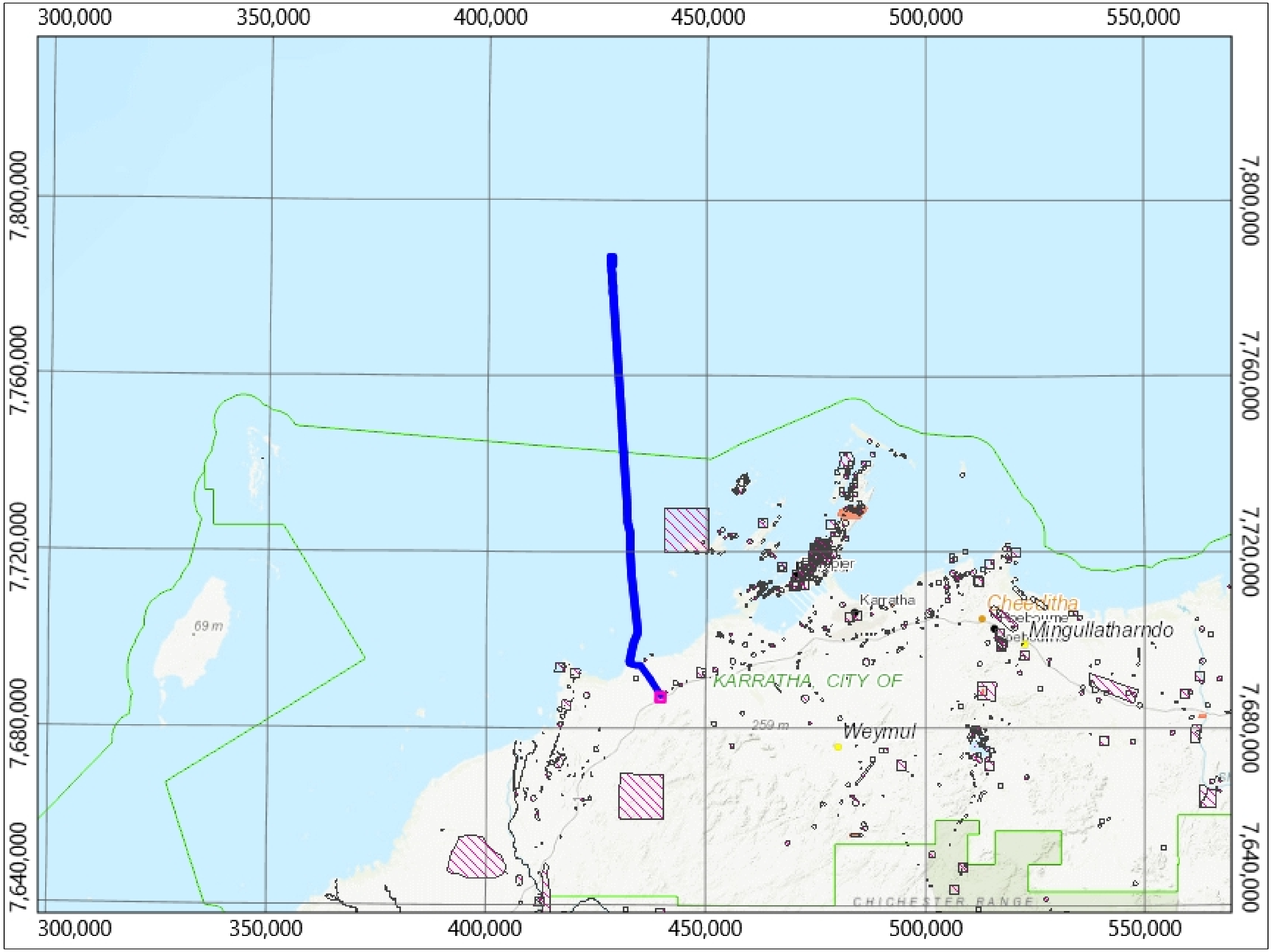


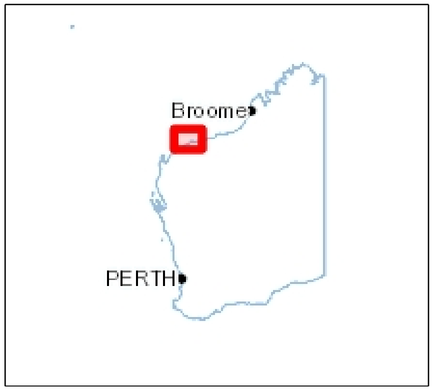
Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

46.50 kilometres

Map Scale 1 : 1,410,000

MGA Zone 50 (GDA94)



Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Lodged

Search Criteria

40 Aboriginal Cultural Heritage (ACH) Lodged in Shapefile - Commonwealth_EMBA_Generalised

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- Culturally Sensitive Nature:
  - No Gender / Initiation Restrictions: Anyone can view the information.
  - Men only: Only males can view restricted information.
  - Women only: Only females can view restricted information.

Status:

- Register: Aboriginal cultural heritage places that are assessed as meeting Section 5 of the Aboriginal Heritage Act 1972.
- Lodged: Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the Aboriginal Heritage Act 1972.
- Historic: Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

Aboriginal Cultural Heritage Inquiry System

List of Aboriginal Cultural Heritage (ACH) Lodged

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
883	BARROW ISLAND 01	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
884	I-24-S0001/S0002	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
885	BARROW ISLAND 03	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
886	C-21-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
887	O-02-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
888	P-05-S0001	No	No	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
889	O-06-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
890	D-20-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
891	Bandicoot Bay Settlement	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
892	BARROW ISLAND 10	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
893	D-20-S0002	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
894	D-16-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
976	ROSEMARY IS.21: HALFWAY CK	No	No	No	No Gender / Initiation Restrictions	Lodged	Traditional Structure	*Registered Knowledge Holder names available from DPLH	
6783	28 MILE CREEK NORTH 2	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	
22943	Flacourt Bay 01	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Rock Shelter	*Registered Knowledge Holder names available from DPLH	
29549	Boodie Soak	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
31762	Site 1	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
31763	Site 2	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36199	Boodie Cave	No	Yes	No		Lodged	Artefacts / Scatter; Rock Shelter	*Registered Knowledge Holder names available from DPLH	
36200	John Wayne Country Rockshelter	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter; Rock Shelter	*Registered Knowledge Holder names available from DPLH	
36234	South End structures, Barrow Island.	No	805180001	No		Lodged	Historical; Traditional Structure	*Registered Knowledge Holder names available from DPLH	
36261	G-13-S0001	No	805180000	No		Lodged	Quarry	*Registered Knowledge Holder names available from DPLH	
36262	H-24-S0001	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36263	H-24-S0002	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36264	I-23-S0001	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36265	I-23-S0002	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36266	I-24-S0003	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36267	J-23-S0001	No	805180000	No		Lodged	Grinding areas / Grooves	*Registered Knowledge Holder names available from DPLH	
36268	J-23-S0002	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36269	J-23-S0003	No	805180000	No		Lodged	Modified Tree	*Registered Knowledge Holder names available from DPLH	
36270	M-03-S0001	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36271	N-02-S0001	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36272	O-02-S0002	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36273	O-05-S0003	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
36344	N-05-S0002	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36345	N-05-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36346	O-05-S0001	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36347	O-05-S0002	No	Yes	No	No Gender / Initiation Restrictions	Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
36348	P-04-S0001	No	805180000	No		Lodged	Artefacts / Scatter	*Registered Knowledge Holder names available from DPLH	
39191	Warnangura (Cape Range) Cultural Precinct					Lodged		*Registered Knowledge Holder names available from DPLH	

Aboriginal Cultural Heritage Inquiry System

List of Heritage Surveys

Search Criteria

18 Heritage Surveys containing 20 Survey Areas in Shapefile - Commonwealth_EMBA_Generalised

Disclaimer

Heritage Surveys have been mapped using information from the reports and / or other relevant data sources. Heritage Surveys consisting of small discrete areas may not be visible except at large scales. Reports shown may not be held at the Department of Planning, Lands and Heritage (DPLH). Please consult report holder for more information. Refer to https://www.wa.gov.au/organisation/department-of-planning-lands-and-heritage/aboriginal-heritage for information on requesting reports held by DPLH.

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Copyright

Access

Some reports are restricted.

Spatial Accuracy

The following legend strictly applies to the spatial accuracy of heritage survey boundaries as captured by DPLH.

Very Good	Boundaries captured from surveyed titles, GPS (2001 onwards) submitted maps georeferenced to within 20m accuracy.
Good / Moderate	Boundaries captured from GPS (pre 2001) submitted maps georeferenced to within 250m accuracy.
Unreliable	Boundaries captured from submitted maps georeferenced to an accuracy exceeding 250m.
Indeterminate	Surveys submitted with insufficient information to allow boundary capture.

Basemap Copyright

Survey Report ID	Survey Area ID	Report Title	Report Authors	Survey Type	Area Description	Spatial Accuracy	Field / Desktop
17576	12304	Cultural responses to the Flandrian Transgression on the Montebello Islands, Northwest Australia	Manne, Tiina Helena	Archaeological	The survey area consists of the Noala Cave site (873), located in the Montebello archipelago. Survey area location and extent are as per the AHMS.	Unreliable	Field and Desktop
20099	12926	Report on an archaeological survey programme Barrow Island	Quartermaine G	Archaeological	The survey area encompasses the whole of Barrow Island, which is situated at a point off the Pilbara coast, 85km north of Onslow and 135km west of Dampier. Survey area and location is as per Figure 1.	Good	Field and Desktop
21993	19482	Draft :environmental impact statement / environmental review and management programme for the proposed Gorgon Development : executive summary	Gorgan Australian Gas	Archaeological/ Ethnographic	Gorgon Development	Unreliable	Field and Desktop
21994	19488	Draft :environmental impact statement / environmental review and management programme for the proposed Gorgon Development : main report volume i	Gorgan Australian Gas	Archaeological/ Ethnographic	Gorgon Development	Unreliable	Field and Desktop
21995	19497	Draft :environmental impact statement / environmental review and management programme for the proposed Gorgon Development : main report volume ii	Gorgan Australian Gas	Archaeological/ Ethnographic	Gorgon Development	Unreliable	Field and Desktop
21996	19504	Draft :environmental impact statement / environmental review and management programme for the proposed Gorgon Development : Technical appendices E1 - E3 social environment assessments	Gorgan Australian Gas	Archaeological/ Ethnographic	Gorgon Development :	Unreliable	Field and Desktop
22954	19778	Report on a site identification survey for the Gorgon Project Pipeline & Construction Footprint on Barrow Island under the Aboriginal Heritage Act 1972 of the proposed Gorgon Project at Barrow Island, Western Australia	Australian Interaction Consultants	Archaeological/ Ethnographic	Pipeline Corridor, an LNG Plant, a Construction Village, Administration site, a Utilities site, and two Re-injection Drill Centres facilities on Barrow Island.		Field and Desktop
24231	18633	Murujuga : Dynamics of Dreaming : Section 16 Research PLan	McDonald, Jo	Archaeological/ Ethnographic	The project is on the Pilbara coast of WA. Several sites were surveyed.	Indeterminate	Field and Desktop
27224	17602	Aboriginal Archaeological Assessment Proposed Barrow Island Infill Drilling Project - Conditional Section 18 Preliminary Archaeological Assessment - Barrow Island, Western Australia	RPS Group	Archaeological	Southern central position of the oilfield on Barrow Island, located approximately 95.0 km north-east of Onslow, Western Australia.	Good	Field and Desktop

Survey Report ID	Survey Area ID	Report Title	Report Authors	Survey Type	Area Description	Spatial Accuracy	Field / Desktop
102133	11655	Report on Preliminary Ethnographic Investigations for the Area Encompassed by the Proposed Ningaloo Marine Park.	Turner, J.	Ethnographic	The survey area consists of the Ningaloo Marine Park, as per figure 1.	Very Good	Field and Desktop
102134	11612	Photographs from the Ningaloo Marine Park Survey for Places of Aboriginal Significance. Mar 1985.	Turner, J.	Ethnographic	The survey area consists of the Ningaloo Marine Park, as per figure 1.	Very Good	Field and Desktop
102496	12406	Report of an Archaeological Survey of Proposed Development Areas in the Cape Range National Park, North West Cape, W.A. Apr 1987.	Morse, K.	Archaeological	The survey area consists of new camping areas and access tracks and parts of the Yardie road realignment, Cape Range National Park. The survey area boundaries could not be delineated. The survey area is approximate only.	Indeterminate	Field and Desktop
102497	11661	Preliminary Report of a Survey for Aboriginal Archaeological Sites in the Cape Range National Park, North West Cape, W.A.	Morse, K.	Archaeological	The survey area consists of the Ningaloo Marine Park project area, as shown in figure 1, with the exception of areas 2 and 3.	Very Good	Field and Desktop
102497	11692	Preliminary Report of a Survey for Aboriginal Archaeological Sites in the Cape Range National Park, North West Cape, W.A.	Morse, K.	Archaeological	The survey area consists of the reef-beach-dune system between Mangrove Bay and Yardie Creek.	Good	Field and Desktop
102607	12930	A Report on Archaeological Work in the Coastal Pilbara, Western Australia. Final Report 1994.	Bradshaw, E.	Archaeological/ Ethnographic	The survey area consists of the coastal strip from the Maitland River to Balla Balla, including the Abydos and Onslow Coastal Plains, and the Dampier Archipelago. The exact extent of the survey area is unknown, but numerous sites have been registered: 900	Unreliable	Field and Desktop
103078	12362	The Aboriginal Occupation of the Montebello Islands,Northwest Australia.	Veth, P.	Archaeological	The survey area comprises of other islands in the Montebello archipelago, not including those in Survey Area 1 (SID1303).	Good	Field and Desktop
103078	12327	The Aboriginal Occupation of the Montebello Islands,Northwest Australia.	Veth, P.	Archaeological	The survey area consists of several islands of the Montebello archipelago, including Ah Chong, Alpha, Bluebell, Campbell, Delta, Hermite, North West, Primrose, South East and Trimouille. See Figure 1.	Good	Field and Desktop
103188	12896	A Report on Archaeological Work in the Coastal Pilbara, Western Australia. Community Resource Document 1994.	Bradshaw, E.	Archaeological/ Ethnographic	The survey area consists of the coastal strip from the Maitland River to Balla Balla, including the Abydos and Onslow Coastal Plains, and the Dampier Archipelago. The exact extent of the survey area is unknown, but numerous sites have been registered: 900	Unreliable	Field and Desktop

Aboriginal Cultural Heritage Inquiry System

List of Heritage Surveys

Survey Report ID	Survey Area ID	Report Title	Report Authors	Survey Type	Area Description	Spatial Accuracy	Field / Desktop
200066	19323	Aboriginal Heritage Site Identification Survey Report of The Chevron Australia Pty Ltd Proposed Gas Treatment Plant Additional Land, Barrow Island, Western Australia : March 2014 [TBD]	Fordyce, Ben ; Lafrentz, Damien	Archaeological/ Ethnographic	Aboriginal Heritage Site Identification Survey Report of The Chevron Australia Pty Ltd Proposed Gas Treatment Plant Additional Land, Barrow Island, Western Australia : March 2014 [TBD]		Field and Desktop
200067	19329	Aboriginal Heritage Archaeological Site Avoidance Survey Report of The Chevron Australia Pty Ltd Proposed Anode Bed Wells, Barrow Island, Western Australia : March 2014 [TBD]	Fordyce, Ben ; Lafrentz, Damien	Archaeological/ Ethnographic	Anode Bed Wells, Barrow Island, Western Australia : March 2014 [TBD]		Field and Desktop

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Cultural Heritage Inquiry System

Map of Heritage Survey Areas

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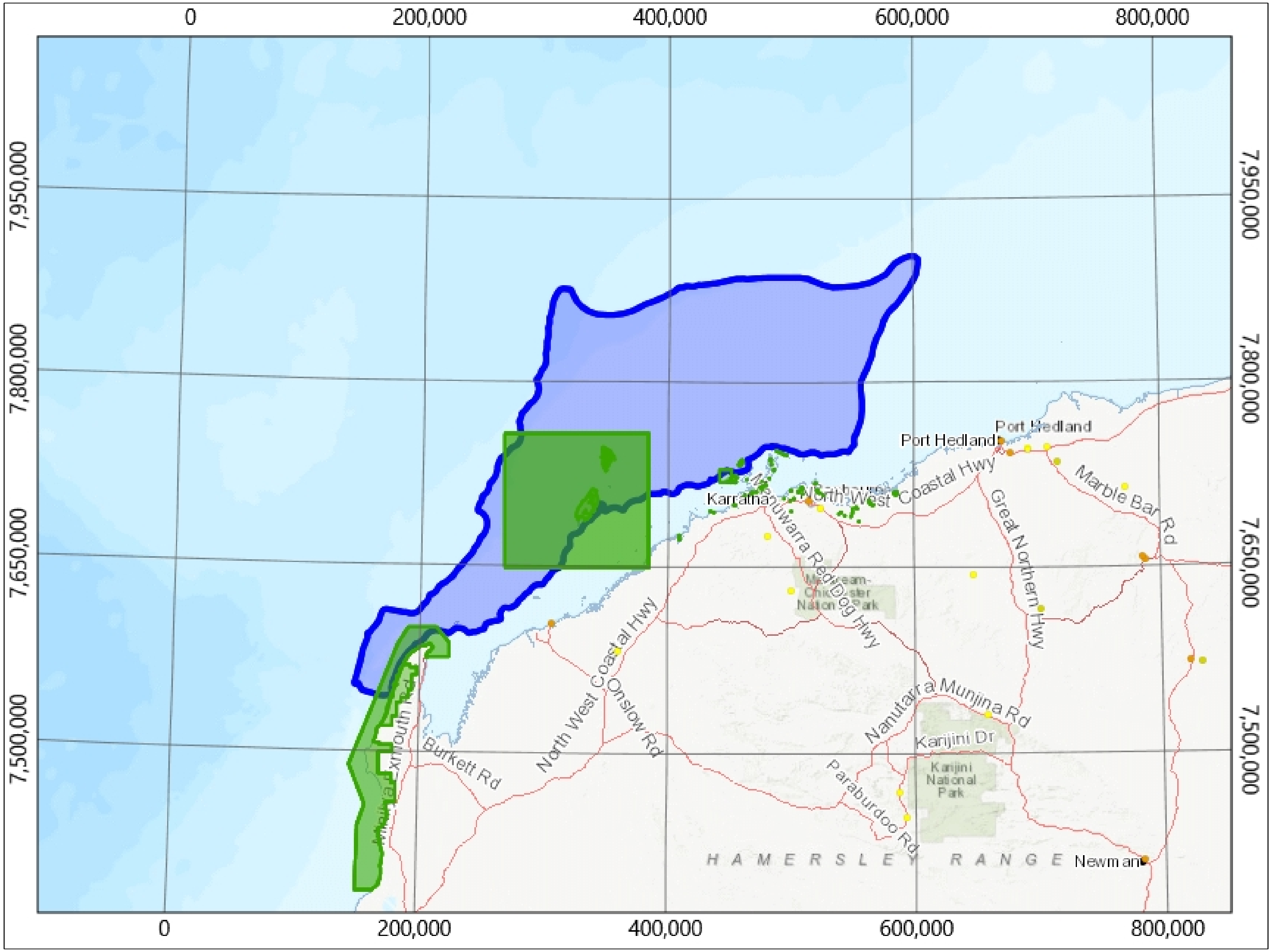


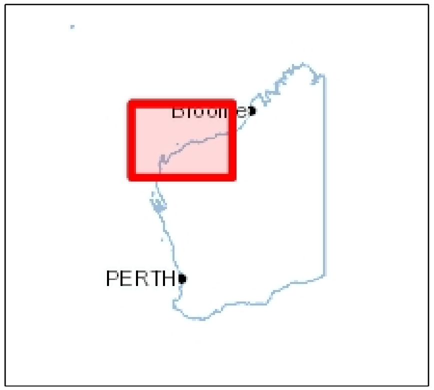
Legend

- Heritage Survey Area
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

165.86 kilometres

Map Scale 1 : 5,030,000

MGA Zone 50 (GDA94)



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List of Aboriginal Cultural Heritage (ACH) Register

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28 Aboriginal Cultural Heritage (ACH) Register in Shapefile - Commonwealth_EMBA_Generalised

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- Boundary Reliable (Yes/No): Indicates whether to the best knowledge of the Department, the location and extent of the ACH boundary is considered reliable.
- Boundary Restricted = No: Represents the actual location of the ACH as understood by the Department..
- Boundary Restricted = Yes: To preserve confidentiality the exact location and extent of the place is not displayed on the map. However, the shaded region (generally with an area of at least $4km^2$) provides a general indication of where the ACH is located. If you are a landowner and wish to find out more about the exact location of the place, please contact the Department of Planning, Lands and Heritage.
- Culturally Sensitive = No: Availability of information that the Department of Planning, Lands and Heritage holds in relation to the ACH is not restricted in any way.
- Culturally Sensitive = Yes: Some of the information that the Department of Planning, Lands and Heritage holds in relation to the ACH is restricted if it is considered culturally sensitive information. This information will only be made available if the Department of Planning, Lands and Heritage receives written approval from the people who provided the information. To request access please contact via https://achknowledge.dplh.wa.gov.au/ach-enquiry-form.
- Culturally Sensitive Nature:
  - No Gender / Initiation Restrictions: Anyone can view the information.
  - Men only: Only males can view restricted information.
  - Women only: Only females can view restricted information.

Status:

- Register: Aboriginal cultural heritage places that are assessed as meeting Section 5 of the Aboriginal Heritage Act 1972.
- Lodged: Information which has been received in relation to an Aboriginal cultural heritage place, but is yet to be assessed under Section 5 of the Aboriginal Heritage Act 1972.
- Historic: Aboriginal heritage places assessed as not meeting the criteria of Section 5 of the Aboriginal Heritage Act 1972. Includes places that no longer exist as a result of land use activities with existing approvals.

Place Type: The type of Aboriginal cultural heritage place. For example an artefact scatter place or engravings place.

Legacy ID: This is the former unique number that the former Department of Aboriginal Sites assigned to the place.

Coordinates

Map coordinates are based on the GDA 94 Datum.

Basemap Copyright

Satellite, Hybrid, Road basemap sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, HERE, DeLorme, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community.

Topographic basemap sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community.

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
873	MONTEBELLO IS: NOALA CAVE.	No	Yes	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden; Rock Shelter	*Registered Knowledge Holder names available from DPLH	P07287
926	MONTEBELLO IS: HAYNES CAVE.	No	Yes	No	No Gender / Initiation Restrictions	Register	Sub surface cultural material; Artefacts / Scatter; Midden; Rock Shelter	*Registered Knowledge Holder names available from DPLH	P07286
966	ROSEMARY IS.11: CHOOKIE BAY	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07219
967	ROSEMARY IS.12: CHOOKIE BAY	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Quarry	*Registered Knowledge Holder names available from DPLH	P07220
968	ROSEMARY IS.13	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07221
969	ROSEMARY IS.14	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07222
970	ROSEMARY IS.15: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Grinding areas / Grooves; Midden	*Registered Knowledge Holder names available from DPLH	P07223
971	ROSEMARY IS.16: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P07224
972	ROSEMARY IS.17: AIRSTRIP	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Quarry	*Registered Knowledge Holder names available from DPLH	P07225
973	ROSEMARY IS.18: DEEP WATER	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07226
974	ROSEMARY IS.19: CHITON	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07227
975	ROSEMARY IS.20: HALFWAY CK	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07228
977	ROSEMARY IS.22	No	No	No	No Gender / Initiation Restrictions	Register	Engraving; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P07230
978	ROSEMARY IS.23: WADJURU R/H	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving; Grinding areas / Grooves; Traditional Structure; Midden; Water Source	*Registered Knowledge Holder names available from DPLH	P07231
979	ROSEMARY IS.24: HUNGERFORD	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P07232
6078	ROSEMARY ISLAND 10	No	Yes	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P07019
6782	28 MILE CREEK NORTH 1	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P06140

ID	Name	Boundary Restricted	Boundary Reliable	Culturally Sensitive	Culturally Sensitive Nature	Status	Place Type	Knowledge Holders	Legacy ID
11328	GAP WELL	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00836
11772	ROSEMARY ISLAND 09	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Midden	*Registered Knowledge Holder names available from DPLH	P00369
11773	ROSEMARY ISLAND 08	No	No	No	No Gender / Initiation Restrictions	Register	Engraving; Grinding areas / Grooves; Traditional Structure	*Registered Knowledge Holder names available from DPLH	P00370
11774	ROSEMARY ISLAND 07	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00371
11775	ROSEMARY ISLAND 06	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00372
11776	ROSEMARY ISLAND 04.	No	No	No	No Gender / Initiation Restrictions	Register	Camp; Engraving	*Registered Knowledge Holder names available from DPLH	P00373
11777	ROSEMARY ISLAND 03	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00374
11789	ROSEMARY ISLAND 01	No	No	No	No Gender / Initiation Restrictions	Register	Artefacts / Scatter; Engraving; Midden; Quarry	*Registered Knowledge Holder names available from DPLH	P00386
11818	ROSEMARY ISLAND 02	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00362
11819	ROSEMARY ISLAND 05	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00363
11820	ENDERBY ISLAND 01	No	No	No	No Gender / Initiation Restrictions	Register	Engraving	*Registered Knowledge Holder names available from DPLH	P00364

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Aboriginal Cultural Heritage Inquiry System

Map of Aboriginal Cultural Heritage (ACH) Register

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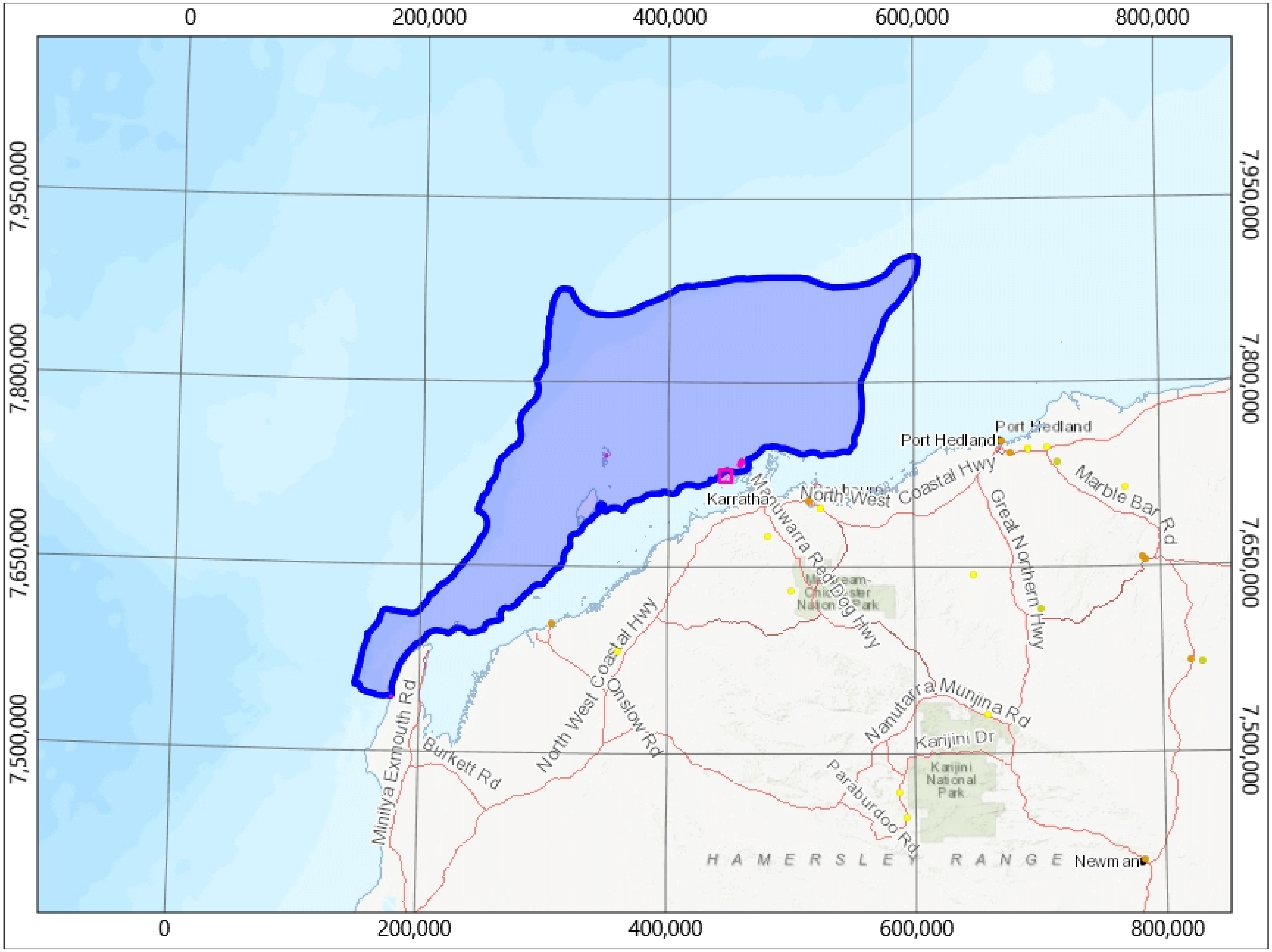


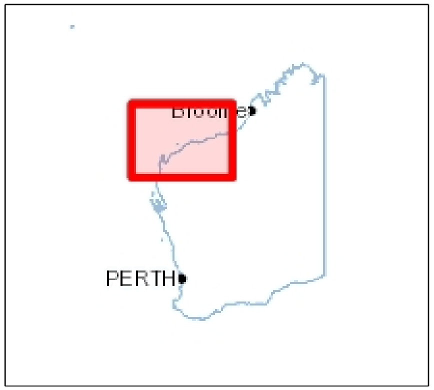
Legend

- Aboriginal Cultural Heritage (ACH) Register
- Search Area
- Aboriginal Community
  - *Permanent*
  - *Seasonal*
  - *Town Based*
- Town
- Road
- River
- Local Government Authority

165.86 kilometres

Map Scale 1 : 5,030,000

MGA Zone 50 (GDA94)



Appendix F Consultation

Fact sheets

Information for relevant persons

Santos

Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan

Activity Overview

Santos operates the normally unmanned Reindeer Well Head Platform (WHP) and associated wells within production licence WA-41-L and the offshore section of the Devil Creek Gas Supply Pipeline (DCG Supply Pipeline) pipeline licence WA-18-PL in Commonwealth waters. These are collectively referred to as the Reindeer facilities (**Figure 1**), with hydrocarbons transported from the Reindeer field to the onshore Devil Creek Gas Plant (DCGP).

The Reindeer field is proposed to continue operations whilst there are sufficient hydrocarbons. However, the Reindeer field is approaching end of field life, at which time production will cease at the Reindeer WHP. Following cessation of production, the pipeline will be put into preservation under a revision to the existing in-force Operations Environment Plan.

This will take place ahead of a future decision on whether to proceed with decommissioning or to re-purpose the DCG Supply Pipeline for Carbon Capture and Storage (CCS) at the depleted Reindeer field. Activities planned during the operations and preservation phase are outlined on Page 2 and typically include infrequent and short duration vessel or helicopter-based inspection, monitoring, maintenance and repair (IMMR) activities.

If the CCS project proceeds, the DCG Supply Pipeline will be brought back into service to transport CO_2 for storage, rather than being decommissioned. Proposed activities beyond preservation are subject to separate government environmental approvals and consultation.

Consultation and Feedback

All petroleum activities in Commonwealth waters must have an Environment Plan (EP) accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before any activities can take place.

Under Commonwealth environment regulations, Santos is required to consult with relevant persons about proposed activities when preparing an EP. A relevant person includes authorities, persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Santos meets this requirement by undertaking consultation in two phases:

- **Preliminary consultation** to understand values and sensitivities and confirm consultation expectations of authorities, persons, and organisations whose functions, interests or activities may be affected by the proposed activities (relevant persons).
- **Consultation** of relevant persons on the specific activities.

This factsheet has been issued to support preliminary consultation as part of the five-year revisions of the Operations EPs and updates to include cessation of production activities. Activity specific consultation is planned to commence on **28 June 2024**, with the consultation period closing on **29 July 2024**. More details on consultation and providing feedback can be found on the back page of this fact sheet.

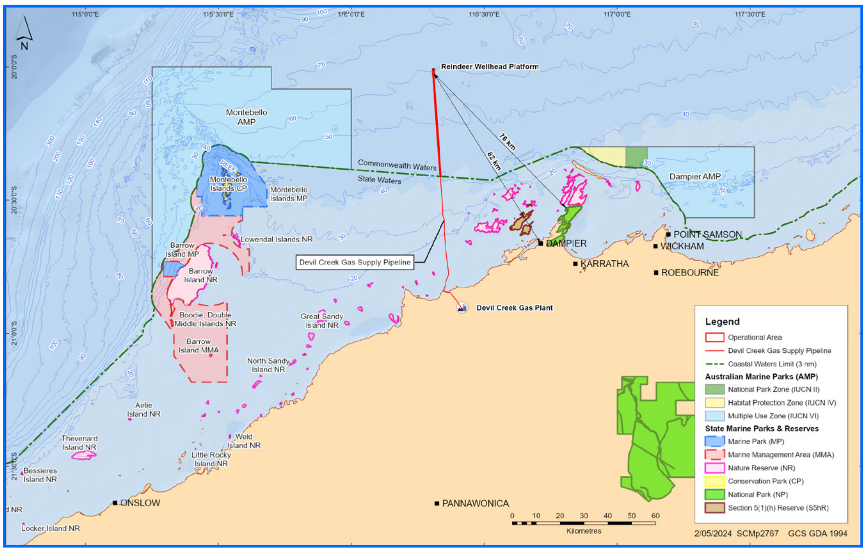


Figure 1. *Reindeer facilities activity location.*

Santos

Activity Description

Activity details	
Timing	The Reindeer facilities are currently in the operations phase and are anticipated to enter a cessation of production (preservation phase) between 2024 and 2026 subject to matters such as field performance and economics.
Duration	The duration of ongoing operations and the timing cessation of production (preservation phase) will be dependent on Santos' decision-making for decommissioning or re-purposing the DCG Supply Pipeline for CCS. A 5-year EP is being sought from NOPSEMA, which will include both operations and cessation of production phases of the activity.
Water depth	The water depth ranges from approximately 61 m at the WHP and reduces to 38 m for the DCG Supply Pipeline at the Commonwealth / State boundary.

Planned activities	**Operations phase activities:**
	• Production and transportation of hydrocarbons from the Reindeer field through the WHP to the DCGP.
	• Bird management activities at the WHP given the presence of birds and the need to manage the WHP for a safe work environment.
	• Suspension of operations activities (prior to cessation of production) including well intervention and/or suspension, flushing and purging of the WHP topsides, subsea equipment and the DCG Supply Pipeline and process equipment of any residual hydrocarbons.
	• IMMR activities, such as:
	  • WHP and pipeline plant inspection, maintenance, modification, removal, repair, and replacement
	  • Marine growth/debris removal and corrosion control
	  • Inline inspections of the offshore pipeline (pigging)
	  • Well intervention
	  • Well suspension or abandonment
	  • Environmental monitoring/sampling (e.g. sediment sampling)
	• Dewatering of the DCG Supply Pipeline of preservation fluid and discharging to the marine environment at the WHP.
	
	Cessation of Production (preservation phase) activities:
	• The DCG Supply Pipeline remains preserved with treated seawater or gas.
	• IMMR, including environmental monitoring/sampling (e.g. sediment and marine growth).
	• Bird management at the WHP.
	• Potential planned discharge of treated seawater at the WHP or back to DGCP to dry the pipeline and enable it to be preserved with nitrogen in the future, if required.

Vessels	Typically, a single vessel would be used to conduct IMMR activities during the life of the EP However, depending on the nature and location of a repair activity, additional vessels may be required.
Aircraft	Helicopters may be used during IMMR activities which may be undertaken during the life of the EP and to assist in emergency, as required.

Description of the natural environment	• The operational area does not intercept any marine protected areas, the closest being the Murujuga National Park and the Montebello Australian Marine Park (AMP), which are located approximately 54 km and 73 km respectively from the nearest boundary of the operational area. • The operational area does not contain any shoreline habitat. Due to water depths, there are no primary producer habitats (including coral and seagrass) within the operational area and soft sediment is the dominant habitat. • The operational area includes Biologically Important Areas (BIAs) for protected marine species that include seabirds, whales, turtles and sharks. • No Key Ecological Features (KEF) intercept the operational area. The closest KEFs to the operational area are the Ancient Coastline at 125 m Depth Contour KEF (located approximately 45 km north from the closest edge of the operational area) and Glomar Shoals KEF (approximately 44km northeast).
Operational Area	The operational area within which the petroleum activity will take place is as per current operations and is defined as: • A 2 km x 1 km area around the WHP and Reindeer-1 well. • An area 250 m either side of the Commonwealth waters section of the DCG Supply Pipeline (from the WHP to the State waters boundary).
Exclusion zone	A 500m petroleum safety zone is in place around the WHP and will remain in place for the duration of this EP.
Petroleum production licences	Production licence WA-41-L Pipeline licence WA-18-PL

Activity Purpose and Approvals

Image 1. *Typical vessel used for IMMR activities.*

The in-force *Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations Environment Plan WA-41-L and WA-18-PL* details the environmental management measures implemented by Santos for operation of the Reindeer facilities. The EP was assessed by NOPSEMA and accepted in June 2020.

Activities proposed to be managed under a revision of the EP are described in the Activity Description table in the previous section.

The preservation phase will begin when the Reindeer facility is no longer producing, and the pipeline has been flushed, cleaned and then filled with a preservation product to preserve the pipeline ahead of a future decision on decommissioning or CCS.

Vessel-related activities will be undertaken during operations and preservation phases.

IMMR activities conducted on the WHP and the DCG Supply Pipeline will be infrequent and of a relatively short duration. Inspections will generally involve a vessel travelling along the route of the DCG Supply Pipeline using towed acoustic instruments or may involve using a Remotely Operated Vehicle (ROV) launched and recovered from the vessel. Typically, vessels will be within the Operational Area for approximately 30 days per year depending on the IMMR requirements.

The *Offshore Petroleum and Greenhouse Gas Storage Environment Regulations* 2023 (Cth) require a titleholder to have an Environment Plan accepted by NOPSEMA before any petroleum activity can commence. An accepted revision of the Operations EP must be in place to enable the cessation of production (preservation phase).

Defining the Environment Area for Proposed Activities

Santos has undertaken an initial assessment to identify the environmental, social, economic, and cultural values and sensitivities that may be affected by impacts and risks of proposed activities.

To do this we have considered the totality of the areas where activity impacts and risks may occur.

These areas are summarised in **Table 1**. The widest extent of these areas is called the Environment that May Be Affected (EMBA), which for this activity is the combined EMBA for the modelled potential worst-case hydrocarbon spill scenarios. These scenarios include a discharge of Reindeer condensate at the WHP from a loss of well integrity, a rupture of the DCG Supply Pipeline and a vessel collision releasing marine diesel oil at the sea surface. This consolidated EMBA is illustrated in **Figure 2**.

Spill EMBAs are defined by overlaying a great number (usually hundreds) of individual, computer simulated, hypothetical hydrocarbon spill events into a single map. Each simulation run starts from the same location (release point) but each run will be subject to a different set of wind and weather conditions derived from historical data. The use of advanced and sophisticated models enables us to present all the areas that could be affected.

While the modelled EMBA represents the theoretical spatial extent that could be contacted by the worst-case spill event(s), an actual spill event is more accurately represented by a single simulation run, resulting in a much smaller spatial extent impacted by the spill.

Often, one or more simulation runs are selected to be representative of the 'worst-case' based on the nature and scale of the activity and the local environment.

Please see the **NOPSEMA Spill Modelling Video** for more information on oil spill modelling and why it is required for the preparation of Environment Plans.

Table 1. *Environment area for proposed activities*

Environment Area
Operational Area
The operational area for the Reindeer WHP and Offshore Gas Supply Pipeline Operations EP is as per the current operational area defined as: • A 2 km x 1 km buffer around the WHP and Reindeer-1 well. • A 250 m buffer either side of the Commonwealth waters section of the DCG Supply Pipeline (from the WHP to the State waters limit).
Environment that May Be Affected (EMBA)
The spatial extent of activity impacts (e.g. light, noise) and risk (e.g. hydrocarbon spill).

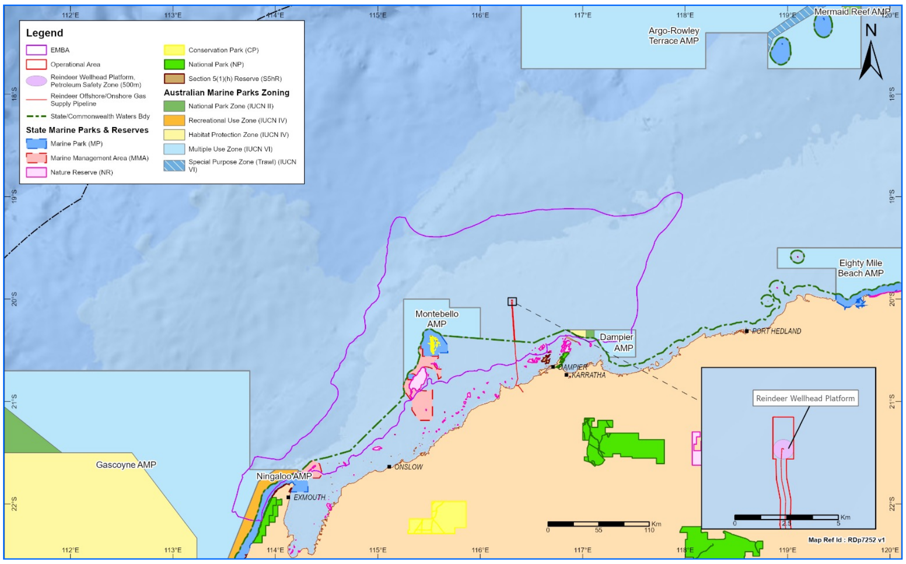


Figure 2. *Reindeer facilities activity location and EMBA*

Santos has undertaken a review of publicly available information to identify environmental, social, economic, and cultural features and/or values that may be affected by activity impacts and risks. The outcomes of this review are summarised in **Table 2**.

Table 2. Environmental, Social, Economic and Cultural Features

Feature	Description	Within Operational Area	Within EMBA	Public Information Review
Aboriginal Heritage	Registered Aboriginal heritage sites protected under the: • *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) • *Aboriginal Heritage Act 1972* (WA)	No	Yes	Barrow Island, Montebello Islands, Exmouth, Dampier Archipelago, Ningaloo Reef and the adjacent foreshores have a long history of occupancy by Indigenous communities. National heritage places including the Dampier Archipelago and the Ningaloo Coast Heritage Area are located 24 km and 238 km from the operational area. There are no registered Aboriginal Heritage sites (*Aboriginal Heritage Act* 1972 (WA)) within the operational area. However, the EMBA overlaps with 28 registered Aboriginal Heritage sites and 40 lodged Aboriginal Heritage sites.
Biologically Important Areas	Biologically important areas (BIAs) are spatially defined areas where aggregations of individuals of a species are known to display biologically important behaviour such as breeding, foraging, resting or migration.	Yes	Yes	The operational area includes BIAs for protected marine species that include seabirds, whales, turtles and sharks.

Table 2. Environmental, Social, Economic and Cultural Features ... continued

Feature	Description	Within Operational Area	Within EMBA	Public information review
Cultural Heritage	Registered cultural sites under the: • *Underwater Cultural Heritage Act 2018* (Cth) • *Maritime Archaeology Act 1973* (WA)	No	Yes	There are no known sites of shipwrecks, sunken aircraft or other types of underwater cultural heritage within the operational area. There are a total of 35 known shipwrecks located within the EMBA. The closest known historic shipwreck is the Dampier which is located approximately 16 km southwest of the operational area. Little is known about the history of this wreck.
Defence	Designated defence activity areas	No	Yes	The operational area does not intersect any designated defence activity areas, however the EMBA overlaps with the North-Western Exercise Area (NWXA).
Energy Industry	Petroleum and CCS activities	No	Yes	Several offshore petroleum projects and exploration activity is present within the region. The DCG Supply Pipeline crosses the Woodside Pluto LNG pipeline approximately 21 km south of the WHP in 50 m of water.

Table 2. Environmental, Social, Economic and Cultural Features ... continued

Feature	Description	Within Operational Area	Within EMBA	Public information review
Fishing	Commercial fishing	Yes	Yes	Several Western Australian (WA) and Commonwealth managed fisheries overlap the operational area and EMBA. No Commonwealth managed fisheries are active in the operational area. WA state managed fisheries active within the operational area include the Pilbara Trap and Fish Trawl Managed Fisheries and the Mackerel Managed Fishery.
	Indigenous, subsistence or customary fishing	No	Yes	Traditional Australian Indigenous fishing in WA waters predominately occurs within inshore tidal waters and is not expected in the operational area.
	Recreational fishing	Yes	Yes	Recreational fishing may occur within the operational area and is known to occur within the EMBA.
Key Ecological Features	Key Ecological Features (KEFs) are elements of the Commonwealth marine environment that are considered to be of regional importance for either a region's biodiversity or its ecosystem function and integrity.	No	Yes	No KEFs intercept the operational area. The closest KEFs to the operational area are the Ancient Coastline at 125 m Depth Contour KEF (located 45 km north from the closest edge of the operational area) and Glomar Shoals KEF (44 km northeast).

Table 2. Environmental, Social, Economic and Cultural Features ... continued

Feature	Description	Within Operational Area	Within EMBA	Public information review
Protected Areas (nearest Commonwealth and Territory)	Australian Marine Parks	No	Yes	The operational area does not intercept any marine protected areas, the closest being the Murujuga National Park and the Montebello Australian Marine Park (AMP), which are located approximately 54 km and 73 km respectively from the nearest boundary of the operational area.
	Western Australian Marine Parks and Marine Management Areas	No	Yes	There are no Western Australian Marine Parks or Marine Management Areas located within the operational area. The Montebello/Barrow Islands Marine Conservation Reserve is located in the EMBA and is approximately 68 km from the operational area. The EMBA also overlaps the Muiron Island Marine Management Area and the Ningaloo Marine Park which are located 238 km and 258 km to the southwest of the operational area, respectively.
Shipping	Shipping routes	Yes	Yes	The Reindeer facilities reside between two shipping fairways, located approximately 50 km to the east and west of the boundary of the WHP. There is a shipping fairway approximately 25 km south of the Reindeer WHP which crosses the offshore gas pipeline. Additional shipping routes are located within the wider region and it is expected that local vessel traffic will pass through the area.

Table 2. Environmental, Social, Economic and Cultural Features … continued

Feature	Description	Within Operational Area	Within EMBA	Public information review
Tourism	Marine and coastal tourism	No	Yes	No known tourism activities occur in the operational area. Within wider EMBA tourism/recreational activities include whale shark tours, fishing charters and whale watching tours associated with the Ningaloo Coast.
Towns / Communities	Dampier	No	No	Dampier is the nearest town and is approximately 81 km south-southeast of the operational area and 48 km southeast of the DCG Supply Pipeline where is crosses the WA and Commonwealth boundary.

We have summarised in Table 3 the potential environmental impacts risks and associated management measures for the proposed activity. These aspects will be risk-assessed within the EP on a case-by-case basis.

Table 3. Activity Impacts and Risk Management

Potential activity impacts	
Acoustic disturbance to fauna	
Description of risks Potential impacts from noise emissions may occur from the following sources: • WHP operation (microturbine generator, pumps and hydraulics). • Support vessel activities (e.g., vessel engines, thrusters and other machinery). • IMMR activities (e.g., use of ROV, Single-Beam and Multi-Beam Echo Sounders and Side Scan Sonar, autonomous underwater vehicle (AUV), diving operations, marine growth cleaning, pigging, modification and replacement of components. • Helicopter activities, including the use of noise-emitting devices to deter birds). • Use of unmanned aerial vehicles in the operational area. • As a result of using a bird management system on the WHP. • Marine growth removal (subsea).	**Compliance with the following key management measures** • Santos' procedure for interacting with marine fauna. • Santos' Bird Management Plan.
Light emissions	
Description of risks Light emissions in the marine environment will occur as a result of: • Safety and navigational lighting on the WHP and on vessels. • Temporary lighting for night-time operations (e.g. maintenance on the WHP or from support vessels). • As a result of using a bird management system on the WHP.	**Compliance with the following key management measures** • Lighting will be used as required, for safe work conditions and to meet navigational requirements. • Premobilisation review and planning of lighting on vessels prior to IMMR activities commencing. • Santos' Bird Management Plan.

Table 3. Activity Impacts and Risk Management ... continued

Atmospheric emissions	
Description of risks Potential impacts from atmospheric emissions may occur in the operational area due to the following operations: • Combustion emissions from the use of gas and diesel powered turbines and equipment on the WHP and the use of fuel in helicopter operations and to power engines and equipment during operational and maintenance activities. • Emissions from the use of vessels. • Cold venting natural gas (methane, ethane, propane and carbon dioxide) as there is no flare present. • Venting of volatile organic compounds (VOCs) (primarily CH4) from drain systems on the WHP. • Fugitive emissions from relief valves and sumps, and also their actuation. • Accidental release of ozone-depleting substances in closed-system rechargeable refrigeration systems.	**Compliance with the following key management measures** • Facilities Planned Maintenance System. • Vessels Planned Maintenance System. • Fuel oil quality meets The International Convention for the Prevention of Pollution from Ships (MARPOL) requirements. • Ozone-depleting Substance Handling Procedures. • Waste incineration management. • International Air Pollution Prevention Certification (IAPP).

Table 3. Activity Impacts and Risk Management ... continued

Seabed and benthic habitat disturbance	
Description of risks Disturbance to the seabed and benthic habitats could potentially occur as a result of the following activities: • Vessel anchoring (non-routine). • Cleaning of subsea infrastructure. • Sedimentation as infrastructure is placed or relocated on the seabed. • Temporary subsea storage of equipment (e.g., ROV basket or clump weight). • IMMR activities (e.g., diving, AUV survey activities, ROV operations, cutting, welding, pigging, installation, replacement or modification of subsea equipment, free span rectification and stabilisation, etc.). • Initial placement of solid structures, deployment, retrieval or movement of equipment and ROV operations; and • Creation of artificial habitat because of the physical presence of infrastructure (and from currents altered by the presence of subsea infrastructure).	**Compliance with the following key management measures** • Planned subsea and offshore maintenance. • Dropped object prevention procedures. • Dropped object recovery. • Anchoring and equipment deployment management.
Physical presence and interaction with other marine users	
Description of risks Potential interactions with other marine users may occur as a result of: • Vessel operations. • Ongoing presence of infrastructure (WHP) and pipeline.	**Compliance with the following key management measures** • Maritime notices. • Santos' stakeholder consultation strategy. • No fishing from project vessels. • Existing (gazetted) WHP Petroleum Safety Zone (PSZ) established around the WHP. • Navigational charting of infrastructure. • Compliant navigation lighting and aids. • Seafarer certification. • Constant bridge watch on support vessels.

Table 3. Activity Impacts and Risk Management … continued

Operational discharges	
Description of risks Planned discharges from the WHP and vessels to the marine environment include: • Sewage and grey water. • Putrescible waste. • Deck drainage. • Cooling water. • Desalination brine. • Bilge water. • Ballast water. • Treated seawater containing oxygen scavenger and biocide.	**Compliance with the following key management measures** • Waste (garbage) management plan. • Deck cleaning product selection procedure. • General chemical management procedure. • Chemical selection procedure. • Sewage treatment system. • Oily water treatment system. • Offshore platform deck drain system and bunding. • Pipeline flushing back to Devil Creek prior to opening of the subsea system for an IMMR activity. • Dispersion modelling of treated seawater discharges into the marine environment.
Potential activity risks	
Unplanned Introduction of invasive marine species (IMS)	
Description of risks Introduction of invasive marine species (IMS) may occur due to: • Biofouling on vessels and external/internal niches (such as sea chests, seawater systems). • Biofouling on equipment that is routinely submerged in water (such as ROVs). • Discharge of high-risk ballast water. • Cross-contamination between vessels.	**Compliance with the following key management measures** • Implementation of the management controls in the Santos Invasive Marine Species Management Plan (IMSMP). • Anti-foulant system. • Ballast water management plan.

Table 3. Activity Impacts and Risk Management ... continued

Unplanned interaction with marine fauna	
Description of risks There is the potential for vessels or equipment (e.g., ROV) involved in operational activities to interact with marine fauna, including potential strike or collision potentially resulting in severe injury or mortality. Fauna strike may also occur from helicopter or unmanned aerial vehicles collision, during take-off and landing.	**Compliance with the following key management measures** • Constant bridge watch on support vessels. • Procedure for interacting with marine fauna. • Constant bridge watch.
Unplanned release of solid objects	
Description of risks Solid objects, such as those listed below, can be accidentally released to the marine environment, and potentially impact on sensitive receptors: • Non-hazardous solid wastes (e.g., paper, plastics and packaging). • Hazardous solid wastes (e.g., batteries, fluorescent tubes, medical wastes, and aerosol cans). • Equipment and materials (e.g., hard hats, tools or infrastructure parts).	**Compliance with the following key management measures** • Waste (garbage) management plan. • Facilities Planned Maintenance System. • Vessels Planned Maintenance System. • Planned subsea and offshore maintenance. • Dropped Object Prevention Procedure. • Dropped Object Recovery.

Table 3. Activity Impacts and Risk Management ... continued

Unplanned hazardous liquid release (non-hydrocarbon)	
Description of risks Sources of risk from minor hazardous liquid releases of chemicals (including corrosion inhibitor, cleaning and cooling agents, recovered solvents, stored or spent chemicals, leftover paint materials and used greases) may occur as a result of: • Bunkering from storage tanks to bulk tanks or transferring to day tanks or due to component failure, such as flexible hoses. • Spills or leaking machinery accidentally discharged overboard in deck drainage water. • Overflow of the open and closed drainage systems. • Tank or pipework corrosion or rupture on the Reindeer WHP. • Loss of primary containment (drums, tanks, intermediate bulk containers, etc.) due to handling, storage and dropped objects (e.g., swinging load during lifting activities). • ROV operations.	**Compliance with the following key management measures** • Planned subsea and offshore maintenance. • Inspection of platform structures and hydrocarbon-containing equipment. • Offshore platform deck drain system and bunding. • Hazardous chemical management procedures. • General chemical management procedures. • Refuelling and chemical transfer procedure. • Spill response equipment on producing offshore platforms. • Vessel spill response plan (Shipboard Oil Pollution Emergency Plan / Shipboard Marine Pollution Emergency Plan) • Remotely operated vehicle inspection and maintenance procedures.

Table 3. Activity Impacts and Risk Management ... continued

Unplanned surface release of condensate from the wellhead platform	
Description of risks The maximum credible spill scenario as a result of a loss of well control is a release of natural gas and condensate (6.5 BSCF and 25,000 STB respectively) over a period of 11 weeks.	**Compliance with the following key management measures** • Planned subsea and offshore maintenance. • NOPSEMA accepted Well Operations Management Plan. • Well services procedures and criteria. • Inspection and corrosion monitoring. • Testing and maintenance of emergency shutdown systems and shutdown/ safety valves. • WHP petroleum safety zone. • Navigational charting of infrastructure. • Navigation lighting and aids. • Dropped object prevention procedure • Support vessel positioning. • Emergency power system is provided on Reindeer WHP to secure secondary power source for safety integrity system. • Operational monitoring of low flow well leak. • In the event of a hydrocarbon spill, an activity specific Oil Pollution Emergency Plan (OPEP) will be implemented to mitigate environmental impacts. The OPEP sets out environmental protection priorities and appropriate response measures for a range of spill scenarios. The OPEP is developed in accordance with National and State marine pollution plans.

Table 3. Activity Impacts and Risk Management … continued

Unplanned subsea release of condensate from a subsea pipeline or subsea well	
Description of risks Sources of risk from a major hydrocarbon releases may occur as a result of: • Pipeline rupture caused by an integrity or corrosion issue, dropped object or anchor drag. • The maximum credible spill scenario as a result of a full pipeline rupture is the release of 121.4 m^3 of reindeer condensate over 3.75 hours.	**Compliance with the following key management measures** • NOPSEMA accepted safety case. • Planned subsea and offshore maintenance. • Inspection and corrosion monitoring. • Testing and maintenance of emergency shutdown systems and shutdown/ safety valves. • Navigational charting of infrastructure. • Anchoring and equipment deployment management. • In the event of a hydrocarbon spill, an activity specific OPEP will be implemented to mitigate environmental impacts. The OPEP sets out environmental protection priorities and appropriate response measures for a range of spill scenarios. The OPEP is developed in accordance with National and State marine pollution plans.
Unplanned surface release of diesel (e.g. from a vessel collision)	
Description of risks The maximum credible spill scenario as a result of a vessel collision is the release of 325 m^3 of marine diesel oil.	**Compliance with the following key management measures** • Seafarer certification. • Navigation lighting and aids. • Support vessel positioning. • Navigational charting of infrastructure. • WHP petroleum safety zone. • In the event of a hydrocarbon spill, an activity specific OPEP will be implemented to mitigate environmental impacts. The OPEP sets out environmental protection priorities and appropriate response measures for a range of spill scenarios. The OPEP is developed in accordance with National and State marine pollution plans.

Santos

Consultation

Consultation provides Santos with an opportunity to receive feedback from authorities, persons and organisations whose functions, interests or activities may be affected by proposed petroleum activities.

This feedback helps us to refine or change the management measures we are planning to address any potential activity impacts and risks. Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is as low as reasonably practicable and acceptable over the life of the activity.

Consultation also helps us to identify values and sensitivities where information is not publicly available, such as spiritual and cultural connection to land and sea country, as well as for us to receive first-hand feedback on commercial and recreational fishing, tourism and local community activities and interests.

Providing feedback

You may be considered a relevant person if, for example, you have spiritual or cultural connections to land and sea country in accordance with Indigenous tradition that might be affected by our activity, or if you otherwise carry out recreational or commercial fishing, tourism or other activities that might be affected by our proposed activity, or if you are part of a local community that might be affected by our proposed activity.

If you consider that you may be a relevant person, please contact us by **28 June 2024** to allow Santos time to initiate consultation with you, so you can tell us how you would like to be consulted throughout the consultation process or if you need additional information. The consultation period for this EP closes on **29 July 2024**.

The merits of relevant person feedback provided through the consultation process will be considered during EP development, with a summary of responses summarised and included in the EP submitted to NOPSEMA for assessment. Please let us know if you would like your personal/organisational details or any part of your feedback to remain private and we will ensure this remains confidential to NOPSEMA.

More information about how community members can participate in environmental approvals for activities proposed in Commonwealth waters has been published in a **brochure** by NOPSEMA.

Contact

E: offshore.consultation@santos.com
T: 1800 267 600
santos.com/offshoreconsultation

Information for commercial fishers

Santos

Review of Operations Environment Plans:

Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Devil Creek Gas Supply Pipeline and Sales Gas Pipeline

Information overview

Santos provides this supplementary information for commercial fishers as part of regulatory consultation activities for the five-year revisions of the Operations Environment Plans (EPs) for our Reindeer Wellhead Platform (WHP) and Devil Creek gas supply pipeline (DC supply pipeline) in Commonwealth waters and the State waters section of the DC supply pipeline in the Carnarvon Basin.

The revision of the EPs supports ongoing operations, as well as the preservation of facilities and pipelines, following the Cessation of Production (CoP), with the Reindeer field nearing the end of economic field life. Two EPs will be prepared, once each for Commonwealth and WA State jurisdiction.

Santos is seeking input from commercial fishers by **29 July 2024**. Details on consultation and providing input can be found on the back page of this fact sheet. Pre and post activity notifications are also available upon request.

General fact sheets on proposed activities in Commonwealth waters and WA State land and waters, including potential environmental impacts risks and associated management measures, can be found at **santos.com/offshoreconsultation**

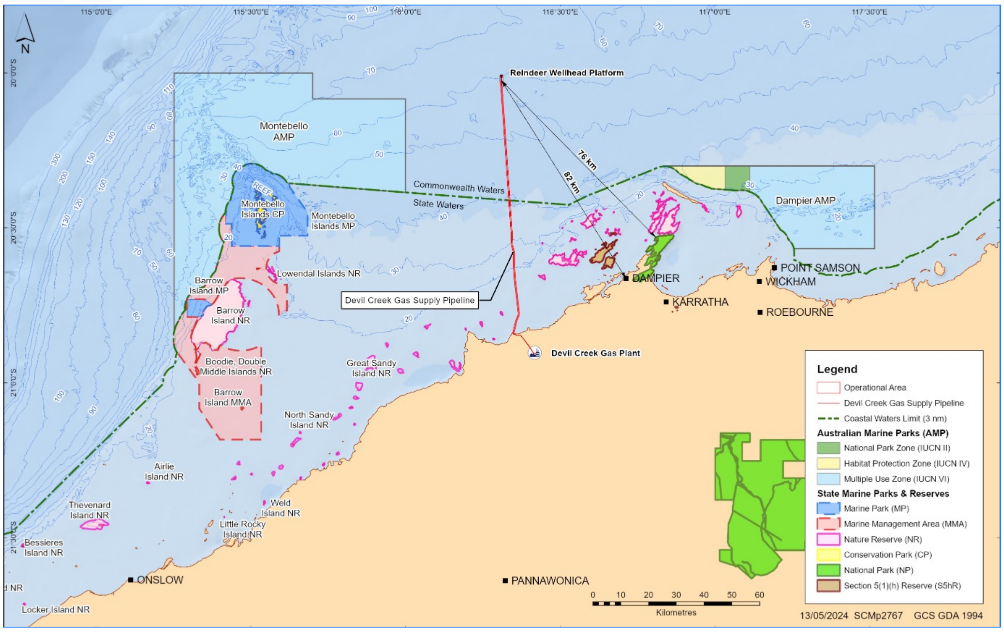


Figure 1. *Reindeer and Devil Creek Operations*

Activity details	
Proposed activity	• Production and transportation of hydrocarbons from the offshore Reindeer field to the onshore Devil Creek Gas Plant via DC supply pipeline) and then to the Dampier to Bunbury Natural Gas Pipeline, followed by suspension of operations. • Preservation of the Reindeer offshore facilities and offshore and onshore pipelines following the CoP.
Activity purpose	• Ongoing gas supply to WA domestic markets. • Preservation of facilities/pipelines ahead of a future decision by Santos on decommissioning or reuse of facilities/pipelines for potential Carbon Capture and Storage (CCS) at the depleted Reindeer field.
Operational Area location	• Reindeer WHP – 82 km north northwest of Dampier, Western Australia. • DC supply pipeline shore crossing – 42.6 km southwest of Dampier.
Water depth	61 m to shore
Timing and duration*	The duration of ongoing operations and the timing cessation of production will be dependent on Santos' decision-making for ongoing operations as well as decommissioning or re-purposing the DC supply pipeline for CCS.
Exclusion zone	There is a 500 m exclusion zone around the WHP, however there is no exclusion zone around the DC supply pipeline.

* Timing and duration of proposed activities are subject to change based on rig availability, adverse weather conditions or technical/equipment issues that may arise during operations.

Commercial fishery implications

Santos has undertaken an assessment to define the environmental, social, economic and cultural aspects that may be affected by proposed activities. To do this we have considered the totality of the area where activity impacts and risks may occur.

The widest extent of this area is called the Environment that May Be Affected (EMBA), which for this activity is a combined EMBA for the modelled potential worst-case hydrocarbon spill scenarios (rupture of the DC supply pipeline and vessel collision releasing marine diesel oil at the sea surface).

Table 1 provides an overview of those fisheries active in the Operational Area to determine potential for interaction with proposed activities. We have also assessed those fisheries that are entitled to fish in the EMBA. Operational Area coordinates can be found in **Table 2**.

Our fisheries assessment is based on publicly available government managed catch and effort data, our ongoing discussions with commercial fisheries representative organisations, and historic engagements for previous petroleum activities.

Table 1. Commercial fishery assessment

	Potential for interaction in Operational Area	Entitled to fish in the EMBA
Commonwealth Fishery		
North West Slope Trawl Fishery	No	Yes
Southern Bluefin Tuna Fishery	No	Yes
Western Deepwater Trawl Fishery	No	Yes
Western Skipjack Tuna Fishery	No	Yes
Western Tuna and Billfish Fishery	No	Yes
Western Australian Fishery		
Exmouth Gulf Prawn Limited Entry Fishery Creator	No	Yes
Mackerel Managed Fishery	Yes	Yes
Marine Aquarium Managed Fishery	Yes	Yes
Nickol Bay Prawn Limited Entry Fishery	No	Yes
Onslow Prawn limited Entry Managed Fishery	No	Yes
Pilbara Crab Managed Fishery	No	Yes
Pilbara Fish Trawl Managed Fishery	Yes	Yes
Pilbara Trap Managed Fishery	No	Yes
Shark and Demersal Gillnet and Demersal Longline Managed Fishery	No	Yes
Specimen Shell Managed Fishery	No	Yes
West Coast Deep Sea Crustacean Managed Fishery	No	Yes
West Coast Rock Lobster Managed Fishery	No	Yes
West Australian Sea Cucumber Fishery	No	Yes
Hermit Crab Fishery	No	Yes

Table 2. Operational Area coordinates

Operational Area	Latitude	Longitude
Reindeer WHP	20°01’26.738”S	116°18’34.999”E
DC supply pipeline shore crossing	20°49’29.891”S	116°21’07.517”E

Consultation

Consultation provides Santos with an opportunity to receive input from authorities, persons and organisations whose functions, interests or activities may be affected by the proposed activities.

This input helps us to refine or change the management measures we are planning to address potential activity impacts and risks.

Santos' objective for proposed activities is to reduce environmental impacts and risks to a level that is As Low As Reasonably Practicable (ALARP) and acceptable over the life of the activity.

Providing input

Santos is seeking input on proposed activities by **29 July 2024**.

The merits of relevant person feedback provided through the consultation process will be considered during EP development, with responses summarised and included in the EP submitted to NOPSEMA for assessment.

Please let us know if you would like your personal/organisational details or any part of your feedback to remain private and we will ensure this remains confidential to NOPSEMA.

More information about how community members can participate in environmental approvals for activities proposed in Commonwealth waters has been published in a **brochure** by NOPSEMA.

Contact

E: offshore.consultation@santos.com
T: 1800 267 600
santos.com/offshoreconsultation

Emails

From:	Consultation, Santos
To:	[redacted]
Subject:	PRELIMINARY CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project
Date:	Thursday, 30 May 2024 4:25:00 PM
Attachments:	image001.png image002.png image003.png image005.png

Preliminary Consultation on:

- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (EP).**
- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan (State waters)**

Santos is contacting you as we are proposing to undertake activities in Commonwealth and State waters offshore northern Western Australia, with respect to our existing Reindeer / Devil Creek Operations.

A revision of the in-force Environment Plans (EPs) is required for the respective Commonwealth and State waters operational components. Activity summaries are provided below for each component, and we have also embedded links in the images to respective fact sheets. These are published on our Consultation Hub at www.santos.com/offshoreconsultation.

The fact sheets include information on:

- the proposed activities;
- potential impacts, risks and management measures; and
- the presence, of environmental, social, economic and cultural features and/or values within the Environment That May Be Affected (EMBA) based on a review of publicly available information.

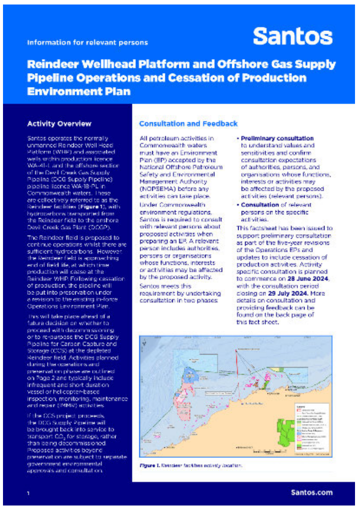
Reindeer / Devil Creek Operations Overview

Santos operates the normally unmanned Reindeer Well Head Platform (WHP) and associated wells within production licence WA-41-L. The operational area of the Reindeer WHP is approximately 80 km north north-west of Dampier, Western Australia. An existing 103 km supply pipeline transports gas/condensate from the Reindeer WHP to the onshore Devil Creek Gas Plant, which is approximately 45 km southwest of Karratha. Reindeer gas is currently supplied into the Dampier to Bunbury Natural Gas pipeline for domestic use. The offshore Reindeer Field will continue production whilst there are sufficient hydrocarbons.

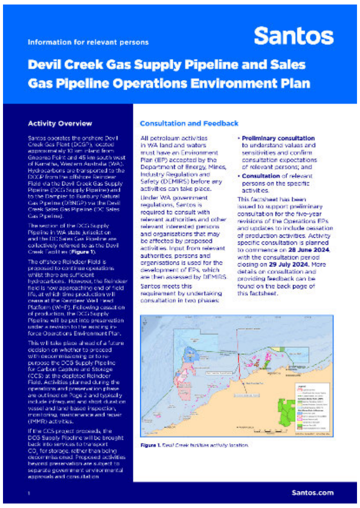
- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations Environment Plan**

  A revision of the in-force EP is being undertaken to support ongoing operations, as well as the preservation of the Reindeer WHP and Gas Supply Pipeline following the Cessation of Production (CoP), with the Reindeer field approaching end of its commercially productive life. The offshore Reindeer Field will continue production whilst there are sufficient hydrocarbons.

  At CoP Santos proposes to put the pipeline into preservation ahead of a future decision on whether to proceed with decommissioning of facilities or to re-purpose the supply pipeline for Carbon Capture and Storage (CCS) at the depleted Reindeer field. Proposed activities beyond preservation are subject to separate government environmental approvals and consultation.



- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan**
  A revision of the in-force EP is being undertaken to support ongoing operations, as well as the placement of the pipeline into preservation following COP from the Reindeer field.



Consultation Requirements

Under the Commonwealth government's environmental regulations, Santos is required to consult with relevant persons whose functions, interests and activities may be affected by proposed activities in Commonwealth waters. Input from relevant persons is used for the development of EPs, which are assessed by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Under Western Australian government regulations, Santos is required to consult with relevant authorities and other relevant interested persons and organisations who may be affected by proposed activities in State waters. Input from relevant authorities, persons and organisations is used for the development of EPs, which are assessed by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS).

Providing Input

Please contact us at the earliest opportunity if you consider you may be a relevant person and wish to participate in the consultation process. We can then discuss with you consultation methods appropriate to your information needs and interests, as well as arrange a suitable meeting date and location to discuss.

Consultation for these activities will commence on **28 June 2024**, with the consultation period closing on **29 July 2024.**

If you would like to provide input now, please note that a summary of your feedback will be included in the EP, including our assessment of your input and our response to you. You can provide input via return email or call us toll free on **1800 267 600**.

Please let us know if you would like any sensitive information to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. Santos will handle your information in accordance with our *Offshore Western Australia and Northern Territory Consultation Privacy Policy*.

Also, please let us know if you know of any other authorities, organisations or individuals who should participate in the consultation process.

Additional resources

NOPSEMA has published information that sets out titleholders' responsibilities for consultation, as well as opportunities for relevant persons to provide guidance for consultation expectations. Click the image to read in full.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

From: Consultation, Santos
To: [redacted]
Subject: CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project
Date: Friday, 28 June 2024 1:34:19 PM
Attachments: image001.png
image002.png
image005.png

Consultation on:

- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (EP).**
- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan (State waters)**

Santos is contacting you again as we are now asking for any input to the revisions to our Environment Plans (EPs) with respect to our existing Reindeer / Devil Creek Operations.

The EPs are being revised for both the Commonwealth and State components of operations to support ongoing operations and the cessation of production from the Reindeer field, as it is approaching the end of its commercially productive life. The offshore Reindeer Field will continue production whilst there are sufficient hydrocarbons.

For context and as described in our earlier correspondence, Santos operates the normally unmanned Reindeer Well Head Platform (WHP) and associated wells within production licence WA-41-L. The operational area of the Reindeer WHP is approximately 80 km north north-west of Dampier, Western Australia.

An existing 103 km supply pipeline transports gas from the Reindeer WHP to the onshore Devil Creek Gas Plant, which is approximately 45 km southwest of Karratha. Reindeer gas is currently supplied into the Dampier to Bunbury Natural Gas Pipeline for domestic use.

Providing input

Please contact us at the earliest opportunity so we can assess and respond to your input during the consultation period, which closes on **29 July 2024**.

Also, please let us know if you know of any other authorities, organisations or individuals who should participate in the consultation process.

More information on proposed activities can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards

Santos Consultation Team

From: Consultation, Santos
Sent: 30 May 2024 16:27
To: [redacted]
Subject: PRELIMINARY CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project

Preliminary Consultation on:

- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (EP).**
-

Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan (State waters)

Santos is contacting you as we are proposing to undertake activities in Commonwealth and State waters offshore northern Western Australia, with respect to our existing Reindeer / Devil Creek Operations.

A revision of the in-force Environment Plans (EPs) is required for the respective Commonwealth and State waters operational components. Activity summaries are provided below for each component, and we have also embedded links in the images to respective fact sheets. These are published on our Consultation Hub at www.santos.com/offshoreconsultation.

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Reindeer / Devil Creek Operations Overview
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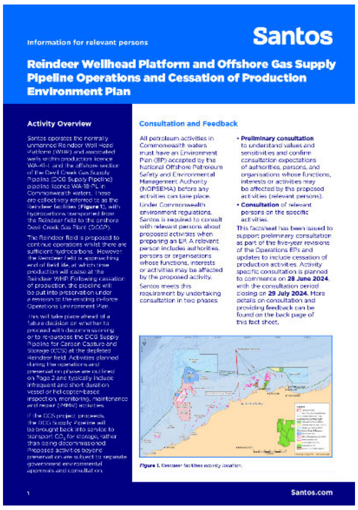
- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations Environment Plan**

  A revision of the in-force EP is being undertaken to support ongoing operations, as well as the preservation of the Reindeer WHP and Gas Supply Pipeline following the Cessation of Production (CoP), with the Reindeer field approaching end of its commercially productive life. The offshore Reindeer Field will continue production whilst there are sufficient hydrocarbons.

  At CoP Santos proposes to put the pipeline into preservation ahead of a future decision on whether to proceed with decommissioning of facilities or to re-purpose the supply pipeline for Carbon Capture and Storage (CCS) at the depleted Reindeer field. Proposed activities beyond preservation are subject to separate government environmental approvals and consultation.


Information for relevant persons
Santos
Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan
Activity Overview
Consultation and Feedback
Santos.com

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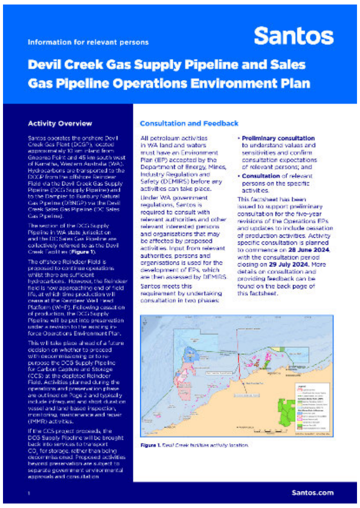
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Santos
Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environment Plan
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Santos.com

Consultation Requirements
Under the Commonwealth government's environmental regulations, Santos is required to consult with relevant persons whose functions, interests and activities may be affected by proposed activities in Commonwealth waters. Input from relevant persons is used for the development of EPs, which are assessed by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Under Western Australian government regulations, Santos is required to consult with relevant authorities and other relevant interested persons and organisations who may be affected by proposed activities in State waters. Input from relevant authorities, persons and organisations is used for the development of EPs, which are assessed by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS).

Providing Input
Please contact us at the earliest opportunity if you consider you may be a relevant person and

wish to participate in the consultation process. We can then discuss with you consultation methods appropriate to your information needs and interests, as well as arrange a suitable meeting date and location to discuss.

Consultation for these activities will commence on **28 June 2024**, with the consultation period closing on **29 July 2024.**

If you would like to provide input now, please note that a summary of your feedback will be included in the EP, including our assessment of your input and our response to you. You can provide input via return email or call us toll free on **1800 267 600**.

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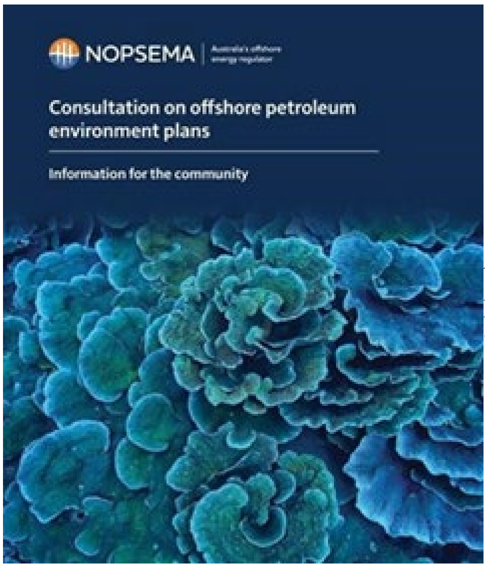

We look forward to hearing from you soon.
Regards
Santos Consultation Team

From: Consultation, Santos
To: [redacted]
Subject: CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project
Date: Friday, 19 July 2024 9:40:40 AM
Attachments: image001.png
image002.png
image005.png

[redacted]

Consultation on:

- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (Commonwealth waters)**
- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan (State waters)**

Santos is contacting you by way of reminder to provide any input to the revisions of Environment Plans for our existing Reindeer / Devil Creek Operations.

Please get back to us at the earliest opportunity should you wish to provide input, noting that if we don't hear from you by **29 July 2024**, we will consider consultation with you closed for this EP, which will be submitted to respective Commonwealth and WA Regulators for assessment.

More information on proposed activities can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

We look forward to hearing from you soon.

Regards
Santos Consultation Team

From: Consultation, Santos <Offshore.consultation@santos.com>
Sent: 28 June 2024 13:29
To: [redacted]
Subject: CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project

Consultation on:

- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (EP).**
- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan (State waters)**

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For context and as described in our earlier correspondence, Santos operates the normally unmanned Reindeer Well Head Platform (WHP) and associated wells within production licence WA-41-L. The operational area of the Reindeer WHP is approximately 80 km north north-west of Dampier, Western Australia.

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Providing input

Please contact us at the earliest opportunity so we can assess and respond to your input during the consultation period, which closes on **29 July 2024**.

Also, please let us know if you know of any other authorities, organisations or individuals who should participate in the consultation process.

More information on proposed activities can be found below in this email. You can provide input via return email or call us toll free on **1800 267 600**.

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Regards

Santos Consultation Team

From: Consultation, Santos
Sent: 30 May 2024 16:25
To: [redacted]
Subject: PRELIMINARY CONSULTATION | Carnarvon Basin | Reindeer / Devil Creek Gas Project

Preliminary Consultation on:

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- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations Environment Plan**

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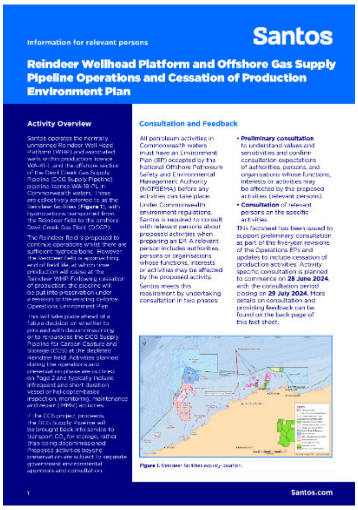

Information for relevant persons

Santos

Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan

Activity Overview

Santos operates the normally unmanned Reindeer Well Head Platform (WHP) and associated wells within production licence WA-41-L and the offshore section of the Devil Creek Gas Supply Pipeline (DCG Supply Pipeline) pipeline licence WA-18-PL in Commonwealth waters. These are collectively referred to as the Reindeer facilities (**Figure 1**), with hydrocarbons transported from the Reindeer field to the onshore Devil Creek Gas Plant (DCGP).

The Reindeer field is proposed to continue operations whilst there are sufficient hydrocarbons. However the Reindeer field is approaching end of field life, at which time production will cease at the Reindeer WHP. Following cessation of production, the pipeline will be put into preservation under a revision to the existing in-force Operations Environment Plan.

This will take place ahead of a future decision on whether to proceed with decommissioning or to re-purpose the DCG Supply Pipeline for Carbon Capture and Storage (CCS) at the depleted Reindeer field. Activities planned during the operations and preservation phase are outlined on Page 2 and typically include infrequent and short duration vessel or helicopter-based inspection, monitoring, maintenance and repair (IMMR) activities.

If the CCS project proceeds, the DCG Supply Pipeline will be brought back into service to transport CO_2 for storage, rather than being decommissioned. Proposed activities beyond preservation are subject to separate government environmental approvals and consultation.

Consultation and Feedback

All petroleum activities in Commonwealth waters must have an Environment Plan (EP) accepted by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) before any activities can take place.

Under Commonwealth environment regulations, Santos is required to consult with relevant persons about proposed activities when preparing an EP. A relevant person includes authorities, persons or organisations whose functions, interests or activities may be affected by the proposed activity.

Santos meets this requirement by undertaking consultation in two phases:

- **Preliminary consultation** to understand values and sensitivities and confirm consultation expectations of authorities, persons, and organisations whose functions, interests or activities may be affected by the proposed activities (relevant persons).
- **Consultation** of relevant persons on the specific activities.

This factsheet has been issued to support preliminary consultation as part of the five-year revisions of the Operations EPs and updates to include cessation of production activities. Activity specific consultation is planned to commence on **28 June 2024**, with the consultation period closing on **29 July 2024**. More details on consultation and providing feedback can be found on the back page of this fact sheet.

Figure 1. Reindeer facilities activity location.

1

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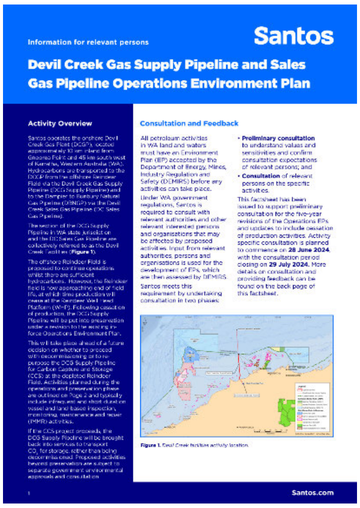
- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environmental Plan**

  A revision of the in-force EP is being undertaken to support ongoing operations, as well as the placement of the pipeline into preservation following COP from the Reindeer field.


Information for relevant persons

Santos

Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environment Plan

Activity Overview

Consultation and Feedback

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Consultation Requirements
Under the Commonwealth government's environmental regulations, Santos is required to consult with relevant persons whose functions, interests and activities may be affected by proposed activities in Commonwealth waters. Input from relevant persons is used for the development of EPs, which are assessed by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA).

Under Western Australian government regulations, Santos is required to consult with relevant authorities and other relevant interested persons and organisations who may be affected by proposed activities in State waters. Input from relevant authorities, persons and organisations is used for the development of EPs, which are assessed by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS).

Providing Input
Please contact us at the earliest opportunity if you consider you may be a relevant person and wish to participate in the consultation process. We can then discuss with you consultation methods appropriate to your information needs and interests, as well as arrange a suitable meeting date and location to discuss.

Consultation for these activities will commence on **28 June 2024**, with the consultation period closing on **29 July 2024.**

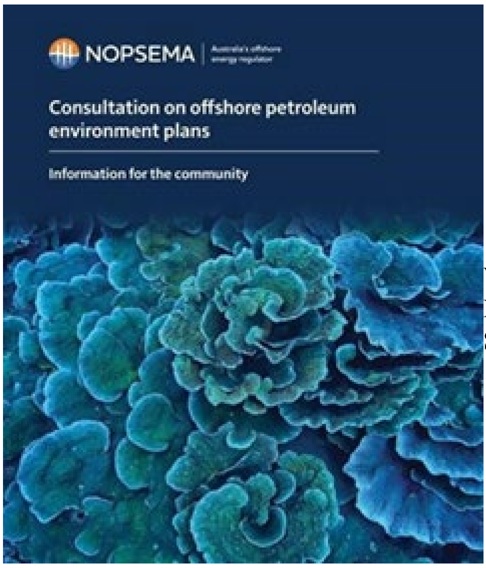
If you would like to provide input now, please note that a summary of your feedback will be included in the EP, including our assessment of your input and our response to you. You can provide input via return email or call us toll free on **1800 267 600**.

Please let us know if you would like any sensitive information to remain private. If requested, Santos will ensure your information remains confidential between us and NOPSEMA and will not be published or otherwise made publicly available. Santos will handle your information in accordance with our *Offshore Western Australia and Northern Territory Consultation Privacy Policy*.

Also, please let us know if you know of any other authorities, organisations or individuals who should participate in the consultation process.

Additional resources

NOPSEMA has published information that sets out titleholders' responsibilities for consultation, as well as opportunities for relevant persons to provide guidance for consultation expectations. Click the image to read in full.



We look forward to hearing from you soon.
Regards
Santos Consultation Team

Advertising

SEEKING RELEVANT PERSONS

CARNARVON BASIN ENVIRONMENT PLANS

Santos

Santos is seeking to identify and consult with relevant persons whose functions, interests or activities may be affected by our proposed activities off Western Australia's north west coast.

Santos is planning proposed activities at our Western Australian interests:

- **Devil Creek Gas Supply Pipeline and Sales Gas Pipeline Operations Environment Plan (EP).**
- **Reindeer Wellhead Platform and Offshore Gas Supply Pipeline Operations and Cessation of Production Environment Plan (EP).**

The Devil Creek Gas Supply Pipeline currently transports hydrocarbons from the Reindeer Well Head Platform (WHP) and associated wells within the Reindeer field to the Devil Creek Gas Plant. The Devil Creek Gas Plant (DCGP) pipeline is located approximately 10 km inland from Gnoorea Point and 45 km south west Karratha, and the Reindeer field is located offshore 103 km from DCGP.

The Reindeer Field is approaching end of its commercially productive life, at which time production will cease and Santos will need to commence planning for the progressive decommissioning. Santos proposes to continue operating the offshore Reindeer Field whilst there are sufficient hydrocarbons.

Following the Cessation of Production, the Devil Creek Gas Supply pipeline, Reindeer platform and wells will be put into a preserved state ahead of planned future use of the Devil Creek Gas Supply pipeline, Reindeer platform and wells for carbon capture and storage (CCS) with preservation currently estimated between 2024 and 2026, subject to matters such as field performance

The environment that may be affected (EMBA) by proposed activities

Santos is assessing impacts and risks to the environment that may be affected (EMBA) by this activity, including on ecosystems (including people and communities), natural and physical resources, the qualities and characteristics of locations, places and areas and the heritage value of places. This will include assessment of the social, economic and cultural features of the environment.

The map below depicts activity locations and a EMBA. The 'EMBA' represents the greatest spatial extent that could be affected by unplanned 'worst case' spill scenarios, noting that in the unlikely event of a spill not all environmental, social, economic and cultural aspects would be affected.

Santos is proposing to implement measures to reduce the impacts and risks of the activities. It is a requirement under relevant environmental legislation that these impacts and risks are reduced to as low as reasonably practicable and to an acceptable level.

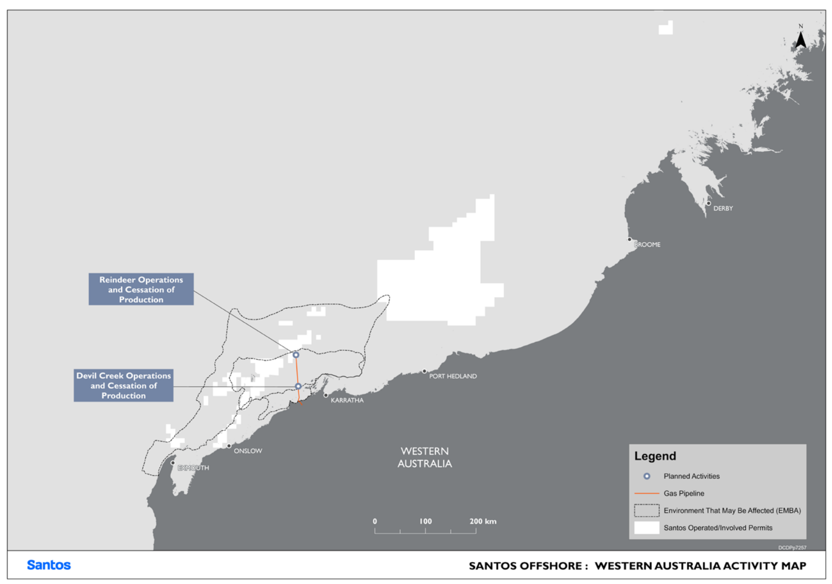
Seeking Relevant Persons for Environment Plans

All petroleum activities must have an Environment Plan (EP) accepted by the respective Commonwealth, State or Territory Regulator before they can take place.

Santos is required to consult with relevant persons about those activities when preparing each EP.

A relevant person includes a person or an organisation whose functions, interests or activities may be affected by the proposed activity. Such functions, interests or activities may include those arising in relation to spiritual or cultural connections to land and sea country in accordance with Indigenous tradition; tourism; recreational and commercial fishing; other commercial or recreational activities and local communities that might be affected by our proposed activity (these are examples and not an exhaustive list).

Feedback from relevant persons is used to refine or change measures proposed to manage activity impacts and risks to a level that is as low as reasonably practicable and acceptable.



Consultation also helps us to identify environmental, social, economic and cultural values and sensitivities that may be affected, in addition to those identified by Santos based on our long-standing operating knowledge in these regions. If you think your functions, interests or activities may be affected by this activity, you may be a relevant person with whom Santos must consult.

We welcome your feedback

We will use feedback from relevant persons to help us manage impacts and risks associated with this activity, ahead of submitting our environment plan to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for assessment. NOPSEMA acceptance of this environment plan is required before any petroleum activity can begin.

We have prepared consultation information sheets, which includes information about planned activities, identified environmental, social, economic and cultural aspects within each EMBA and how we propose to manage impacts and risks.

Contact us

If you consider you may be a relevant person, please contact us by **28 June 2024** to allow Santos to initiate consultation with you in relation to the proposed activity and so you can tell us how you would like to be consulted throughout this process.

Santos is committed to undertaking genuine and meaningful consultation. We want to provide information for people to make informed assessments of the possible consequences of the proposed activity on them.

Your feedback and input are important to us and input will be considered in the development of our environment plan.

Visit: **www.santos.com/offshoreconsultation/carnarvon**
Phone: **1800 267 600**
Email: **offshore.consultation@santos.com**
for more information, to self-identify as relevant person or to provide feedback.

CARNARVON BASIN ENVIRONMENT PLANS

Santos

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Following Cessation of Production, Santos proposes to put the Devil Creek Gas Supply Pipeline, Reindeer platform and wells into preservation ahead of a future decision on whether to proceed with decommissioning of facilities or to re-purpose these facilities for Carbon Capture and Storage (CCS) at the depleted Reindeer field. Proposed activities beyond preservation are subject to separate government environmental approvals and consultation.

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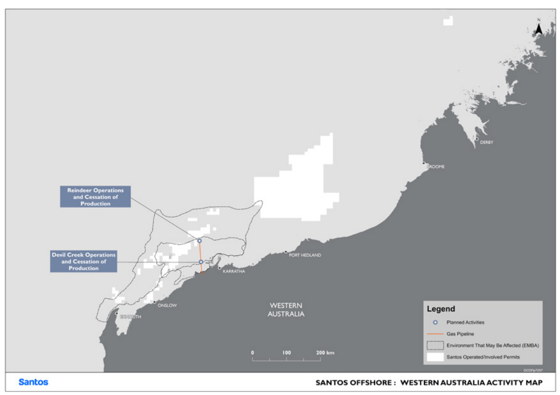

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If you consider you may be a relevant person, please contact us as soon as possible to allow Santos to initiate consultation with you in relation to the proposed activities and so you can tell us how you would like to be consulted. Consultation closes on **29 July 2024**.

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Santos
Santos is seeking to identify and consult with relevant persons
whose functions, interests or activities may be affected by our proposed Reindeer / Devil Creek Gas continued operations activities off Western Australia's north west coast

Client: SANTOS
Campaign: Devil Creek Ops
Key Number: 5SAN030624A
Length: 30s
Date: 07.06.24
AM: Thea Petros
Writer: Supp/Amelia
Station/s: Hit 106.5 FM – Karratha
Contact: Thea Petros

VO **FEMALE; SERIOUS AND MATTER OF FACT.**

BED **SERIOUS AND PROFESSIONAL.**

PRON **KARRATHA – KUH- RAA -THUH, LIKE ARTHER WITH CURR IN FRONT.**

VO Santos seeks to consult with persons whose functions, interests or activities may be affected by operation and preservation of our Reindeer offshore facilities approximately 82 kilometres northwest of Dampier, and the Devil Creek Gas Plant, approximately 45 kilometres southwest of Karratha.

To be consulted, please contact Santos by June 28.

See Santos dot com forward slash offshore consultation…

Call1800 267 600.

Or email offshore dot consultation at Santos dot com.

THE STUDIO AT SCA

Campaign: Reindeer Ops
Key Number: 5SAN030624B
Length: 30s
Date: 07.06.24
AM: Thea Petros
Writer: Supp/Amelia
Station/s: Hit 106.5 FM – Karratha
Contact: Thea Petros

VO	**FEMALE; SERIOUS AND MATTER OF FACT.**
BED	**SERIOUS AND PROFESSIONAL.**
PRON	**KARRATHA – KUH-RARTHER, LIKE ARTHER WITH CURR IN FRONT.**
VO	Santos is consulting with persons whose functions, interests or activities may be affected by the operation and preservation of our Reindeer offshore facilities approximately 82 kilometres northwest of Dampier, and the Devil Creek Gas Plant, approximately 45 kilometres southwest of Karratha. To be consulted, please contact Santos. Consultation closes July 29. See Santos dot com forward slash offshore consultation… Call 1800 267 600. Or email offshore dot consultation at Santos dot com.

Tearsheets

Making dent in kids RSV

WA's infant immunisation program having a dramatic impact

CLAIRE SADLER

WA is reporting lower rates of RSV cases and hospital admissions than the rest of the country following the rollout of the State's infant immunisation program in April.

By the start of RSV Awareness Week (June 2-8), Australia had already recorded more than 47,000 cases of the virus in children aged under five, nearly two-thirds the total number of cases reported in 2023.

However, WA is reporting lower rates of respiratory syncytial virus cases with under five-year-olds in the State, having only 729 of the cases across the country.

Its smaller amount of cases comes as more than 10,000 infants have been immunised against RSV in the first two months of the program, which is expected to prevent at least 400 hospital admissions.

The virus usually causes mild, cold-like symptoms and people normally recover in a week or two. However it can be more serious, particularly for children under a year old who can develop pneumonia or bronchiolitis.

"Without immunisation, we know that around 12,000 Australian babies are hospitalised with pneumonia and bronchiolitis caused by RSV each year, with one-in four requiring intensive care," Immunisation Foundation of Australia director Catherine Hughes said.

"Hospitalisation data from Western Australia shows a low rate of infant admission due to RSV for this time of the year. The message is clear — infant RSV immunisation keeps babies out of hospital."

Despite the lower rates of RSV in young children, Perth epidemiologist Associate Professor Hannah Moore urged parents to get their babies immunised as a winter spike was expected.

"With the recent cool change in weather, we're expected to see a spike in reported cases of the seasonal virus in the west," she said.

Nicole Woolf's 18-month-old twins Raphael and Abigail were admitted to hospital last year. Picture: Ross Swanborough

A mother of twins, Nicola Woolf, said immunisation would have meant there was a much lower chance of her children being admitted to hospital with severe RSV.

"The doctor examined my son and said you just need to go right now to emergency as he is not breathing properly and is working extremely hard to breathe," Ms Woolf said.

"I ended up taking both kids in with me to the hospital. My daughter was happy and eating well but they examined her anyway and it was actually her that they were most worried about in the end with her breathing, which was really scary.

"They both were admitted and both put on all different forms of oxygen because their oxygen just kept dropping.

"It was after admission when we were sent home to manage on our own that was the most stressful."

Ms Woolf urged other parents to opt for their immunisation ahead of the winter surge.

"RSV just seems like something the twins are going to be susceptible to when they go into day care every winter season so I'm definitely encouraging all parents out there to take up the option for immunisation," Ms Woolf said.

Team celebrates one year

JESSICA MORONEY

Workpower Geraldton is celebrating one year since taking over former disability support agency Activ Foundation and ensuring people with disability have secure employment.

On Friday, the team at Workpower Geraldton celebrated the organisation's one-year anniversary with a barbecue lunch.

City of Greater Geraldton mayor Jerry Clune attended and received a tour of the workshop.

Workpower took over operations on June 12 last year after Activ Foundation announced the closure of seven workshops across the State.

It left about 750 people with disabilities fearing for their employment future.

Workpower chief executive Lee Broomhall said the acquisition has ensured people in Geraldton can continue with the work they are proud of.

"We're very proud of the progress we've made over the past year," she said.

"We've successfully transitioned seven worksites across Western Australia and integrated well into the local communities, creating valuable partnerships with local businesses, and providing opportunities for people with disability to thrive in a supportive and inclusive environment."

Workpower is the Mid West's largest craypot manufacturer and was awarded for their leadership and development programs at the Western Australian Fishing Industry Council Inc's annual awards earlier this year.

The company was recognised for employing more than 21 people with disability to manufacture high-quality pots, with some team members having more than 20 years experience in shaping pots.

ABOVE: Employees Darcy Owen, Jon Sindelar, Ryan Mitchell, Jon Taylor, and Jordan Cole. RIGHT: Geraldton mayor Jerry Clune visits.

Boost for DV victim support

JESSICA MORONEY

Two Mid West organisations have received a share of $7 million to provide individual support for people experiencing family, domestic and sexual violence.

Last week the State Government announced funding would be allocated over two years to continue the Flexible Support Package program, providing individualised support packages to victim-survivors. More than 40 family and domestic violence organisations across the State will receive a share of the funding.

In Geraldton, Desert Blue Connect and Mission Australia will share a portion of the funding, which will be used as direct financial support in the Mid West.

People can access practical supports to improve safety and rebuild their lives, such as furniture and household goods or items to meet daily living needs.

Prevention of Family and Domestic Violence Minister Sabine Winton said no two experiences of family and domestic violence were the same and individualised support could help people in areas that were most needed.

Email to gun owners defended

JAKE DIETSCH & DYLAN CAPORN

WA Police are imposing gun limits that have not been legislated — warning new firearm applicants that their forms will be rejected under reforms being debated in Parliament.

Police modelling has shown up to 85,000 licensed firearms are set to be impacted by the new laws.

Emails from WA Police to applicants for firearms — obtained by The West — reveal that officers have cited the Firearms Bill 2024, which has passed the Legislative Assembly but not the Legislative Council, and told applicants that they would be refused because of the proposed laws.

They are then told to change their application by either disposing of "one of your currently licensed firearms" to a police station under a voluntary buyback scheme or getting a different licence.

"If you request that your application is put through with no changes to your licence, it will lead to the approval sergeant refusing your application," the email says.

"If this occurs, you will have the option to lodge a dispute with the State Administrative Tribunal."

The correspondence comes despite the Government seeking to amend the law to make it easier to seize guns from suspected domestic violence offenders.

It follows the murder-suicide in Floreat where gunman Mark Bombara killed Jennifer and Gretl Petelczyc in search for his ex-partner before turning the weapon on himself.

Opposition Leader Shane Love, whose National Party is against the Bill, said police were being "presumptive".

"The legislation hasn't passed through the Parliament. We now know that the Government itself is again making amendments to the legislation," Mr Love said.

The Nationals leader said regulations that underpin the legislation were yet to be written and Police Minister Paul Papalia had promised consultation with shooting groups as they were developed.

"So how you could possibly be sending letters out before either the legislation or the regulations have been delivered is beyond me," Mr Love said.

Mr Papalia confirmed in Parliament this week that WA Police had endorsed a change to their firearms licensing process procedures, adopting a policy position to better align with the Bill. "It's absolutely appropriate that every licensed firearms owner in the State be notified of the opportunity to participate in the buyback scheme.," he said.

"For people specifically who currently exceed the proposed limits, it's fair that they'd be notified so they can participate in the buyback scheme.

"Otherwise at the end when of the process when the law comes into effect, if they are in excess of their numbers of firearms that they hold or in excess of the allowable limit — all of the firearms will be seized."

The State Government has bought back more than 13,000 firearms, with modelling showing up to 85,000 firearms were set to be impacted by the legislation.

Mr Papalia warned that firearm owners who breached the new laws would have of their weapons taken away.

"The changes will remove tens of thousands of firearms from the community, making our streets safer for everyone," he said.

"If gun owners don't comply with the strict new requirements when the new laws come into effect, their licence will be revoked and they could face criminal charges.

"The Cook Government's $64.3 million dollar buyback offers firearm owners an opportunity to get paid for their guns."

Police Minister Paul Papalia. Picture: Riley Churchman

Dutton forges ahead of Albo

ADELAIDE LANG

Opposition Leader Peter Dutton has edged out Prime Minister Anthony Albanese as the preferred leader as recent polling shows support for Labor is decreasing on critical issues.

It's the first time Mr Dutton has eclipsed Mr Albanese as the preferred prime minister in the Resolve Political Monitor, the surveys regularly conducted for the Sydney Morning Herald.

The findings published by the masthead show the Opposition Leader has gained a narrow lead over his opponent with 36 per cent of voter support compared to 35 per cent for Mr Albanese.

When asked how the Prime Minister was performing in office, 36 per cent of respondents said he was doing a good job while 50 per cent of respondents said he was doing a poor job.

Meanwhile, Mr Dutton attracted praise from 42 per cent of voters while 40 per cent rated his performance as poor.

The surveys showed support for the Coalition remained steady at 36 per cent over the past month, but Labor's primary vote fell to a three-year low of 28 per cent. Notably, 40 per cent of voters canvassed for the poll ranked Mr Dutton and the Coalition the top choice to manage the economy while 24 per cent chose Mr Albanese and Labor.

Peter Dutton Pic: NewsWire

On the topic of national security and defence, 42 per cent backed the Opposition Leader while 23 per cent supported the Prime Minister.

When asked which leader would do a better job of keeping the cost of living low, 32 per cent of voters backed Mr Dutton while 25 per cent favoured Mr Albanese. The results reflect the country's growing frustration with soaring prices and the impact of consistent interest rate hikes.

When voters were asked to identify the most important policy issue, 54 per cent pointed to keeping the cost of living low.

Mr Dutton was favoured by 32 per cent of respondents as the safer hands for the job, while Mr Albanese held the support of 25 per cent.

However, both major parties held equal standing with backing from 32 per cent of the voters on the issue of jobs and wages.

Mr Albanese and Labor attracted more support on the issue of environment and climate, with 24 per cent of the vote in contrast to 22 per cent support for Mr Dutton and the Coalition.

The findings come after Mr Dutton refused to reveal key details of the Coalition's nuclear power policy after declaring he would oppose a 2030 carbon emissions target at the next election.

The polling also revealed good news for the Greens, who gained two percentage points of support and lifted their primary vote from 12 to 14 per cent.

Cycling champion Ava Rodgers whose mother is worried about rising insurance premiums. Opposite page: RBA governor Michele Bullock. Main picture: Jackson Flindell

Cars, houses feel the heat

SEAN SMITH

West Australian households are labouring under another year of soaring insurance premiums as insurers ramp bills up even higher to cover escalating repair costs for homes and cars.

The State's biggest general insurer, the RAC, has revealed that while annual premium increases have moderated over the past year, they are still running ahead of the annual inflation rate of 4 per cent, with renewing customers being hit with price rises of up to 19 per cent.

RAC, which finished the 2023 financial year with about 56 per cent and 35 per cent of the State's motor and home and contents markets respectively, sees little immediate relief for households, warning "we are unlikely to see a deflation in claims".

This time last year, the motoring mutual was slapping customers with premium rises of 15 per cent to 20 per cent, insisting they were necessary to meet the high cost of car parts, labour and building repairs.

"For current renewals, premium increases typically range between 4 and 19 per cent," the RAC told The West Australian. "The rate of change is slowing, but the underlying cost base is still going up. This includes supply-chain inflation which has driven up the cost of claims. The cost and availability of materials, parts, trades and services continues to be an issue for home and car repairs in WA. An example of this is additional features in newer cars are costly to repair and calibrate."

This is particularly true for electric vehicles, with a recent British study quoted by investment bank Macquarie finding EV claims were 25.5 per cent more expensive than internal combustion engine equivalents and took 14 per cent longer to repair.

Data from the Insurance Council of Australia shows the nation's home-building insurance premiums rose an average 13.9 per cent in the year to March 31, followed by a 12.7 per cent rise in motor insurance and 3.7 per cent rise for household contents premiums.

Insurance Australia Group, which operates some of the country's biggest general insurance brands including NRMA and CGU, did not reveal its current premium rises.

However, it acknowledged the growing cost-pressure on households, adding it was "working to keep increases to a minimum for our customers".

Dignity the winner amid 'theft' furore

ANNA COX

A Geraldton woman who was set to go to trial for stealing sanitary products worth $10 could soon have her charge dropped after news of the case sparked outrage in the community.

The story prompted period equity organisation Share the Dignity to call for systemic changes to improve access to these essential products to help tackle the growing problem of period poverty.

The 31-year-old woman was alleged to have stolen $10 worth of sanitary products from a store in Bluff Point on January 9.

She was listed to appear in Geraldton Magistrates Court on June 10, but could not appear after contracting COVID and her matter is listed to go to trial on July 29.

The story was picked up by Share the Dignity, and attracted thousands of comments on its social media pages expressing outrage the matter had progressed this far and the costs of going to trial.

Mid West Supt Steve Post confirmed to the Geraldton Guardian that the charges were in the process of being dropped by the complainant. "It's in the process of being discontinued," he said.

Share the Dignity founder and chief executive Rochelle Courtenay said: "The fact that stealing them is your only option is a really sad reflection of society."

A change is in the air

DYLAN CAPORN

West Australians will now be warned of natural disasters — such as fires, floods and cyclones — via a consistent three-level alert system under changes revealed by the State Government on Monday.

Under the Australian Warning System, which is being rolled out across WA, all hazards will share the same language, colour and icons across Australia.

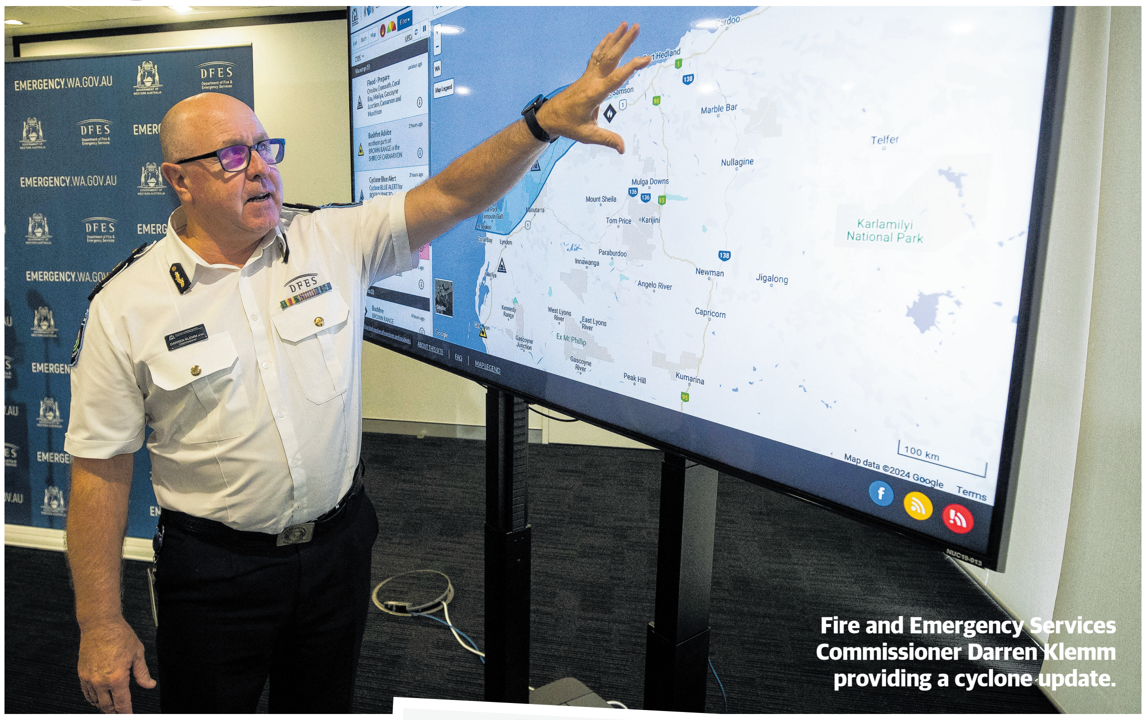
The new system will replace the current warning for cyclones — blue, yellow and red alerts — with the same model currently used for bushfires. The three levels of alerts across all disasters will be simplified to advice, watch and act, and emergency warning on the State's Emergency WA platform and website.

Advice will prompt nearby residents to be aware of an incident, providing no immediate threat to lives or homes.

Watch and act will ask locals to protect themselves due to a "possible threat", while the emergency warning will alert residents to danger from a threat to lives and homes.

The new model will also remove the 'all clear' level, which will be replaced by a final advice message highlighting the remaining hazards after a cyclone has passed or a bushfire is extinguished.

Emergency Services Minister Stephen Dawson also announced a $16 million upgrade to the Emergency WA website.



Fire and Emergency Services Commissioner Darren Klemm providing a cyclone update.

WARNING SYSTEM

Advice: An incident has started but there is no immediate threat. Be aware and keep up to date.

Watch and Act: There is a possible threat to lives and homes. Take action now to protect yourself and others.

Emergency Warning: There is a threat to lives and homes. You may be in danger and need to take immediate action.

New warning icons for emergencies in WA.

ASIC commissioner Alan Kirkland. Picture: LinkedIn

Customers to get fee refund

CHEYANNE ENCISO

Four Australian banks will cough up nearly $30 million in refunds after a review by the Federal corporate watchdog revealed they had charged high fees to customers who could least afford it.

A report from the Australian Securities and Investments Commission revealed ANZ, Commonwealth Bank, Westpac, as well as mid-tier Bendigo and Adelaide Bank kept at least two million low-income customers in high-fee accounts.

These included many customers relying on Centrelink payments.

The report released on Monday came after an ASIC review focused on improving financial outcomes for First Nations customers by addressing avoidable bank fees.

"We focused in this project on the banks who were most likely to have First Nations consumers on low incomes trapped in high-fee accounts," ASIC Commissioner Alan Kirkland said. ASIC said the four banks have committed to moving more than 200,000 customers into low-fee accounts, saving them about $10.7m a year.

> We're expecting all of them to read the report and make improvements to their practices.
> **Alan Kirkland**

The financial institutions will also refund more than $28m in fees to these customers over the next 12 to 18 months.

This includes $24.6m to Aboriginal and Torres Strait Islander students and apprentices receiving ABSTUDY payments, and customers in areas with significant First Nations populations.

"At any time ASIC, and the community, expects that the banks will treat their customers fairly," Mr Kirkland, pictured, said.

"But that's particularly important for people on low incomes and for people who are struggling to make ends meet, the last thing they need is to have the very little income that they have being eaten away in unnecessary bank fees."

Before the review, Mr Kirkland said most banks only provided their customers with difficult opt-in processes for switching to low-fee options, including forcing some to travel hundreds of kilometres to their nearest bank branch.

He said the implications of ASIC's latest review applied to all banks across the country.

"We're expecting all of them to read the report and make improvements to their practices to stop other people being trapped in high-fee accounts that they can't afford," Mr Kirkland said.

ASIC in the report provided recommendations to minimise harm to customers, including improving processes for customers opening accounts, and to migrate from high-fee to low-fee accounts.

Appendix G Environmental Consequence Descriptors

Offshore Division Environmental Hazard Identification and Assessment Guideline – Environmental Consequence Descriptors

	Consequence Level	I	II	III	IV	V	VI
	Acceptability	**Acceptable**	**Acceptable**	**Unacceptable**	**Unacceptable**	**Unacceptable**	**Unacceptable**
	Severity Description	**Negligible** ***No impact or negligible impact.***	**Minor** ***Detectable but insignificant change to local population, industry or ecosystem factors. Localised effect***	**Moderate** ***Significant impact to local population, industry or ecosystem factors.***	**Major** ***Major long-term effect on local population, industry or ecosystem factors.***	**Severe** ***Complete loss of local population, industry or ecosystem factors AND/ OR extensive regional impacts with slow recovery.***	**Critical** ***Irreversible impact to regional population, industry or ecosystem factors.***
Environmental Receptors	**Fauna** In particular, EPBC Act listed threatened/migratory fauna or WA Biodiversity Conservation Act 2016 specially protected fauna	Short term behavioural impacts only to small proportion of local population and not during critical lifecycle activity No decrease in local population size No reduction in area of occupancy of species No loss/disruption of habitat critical to survival of a species No disruption to the breeding cycle of any individual No introduction of disease likely to cause a detectable population decline.	Detectable but insignificant decrease in local population size Insignificant reduction in area of occupancy of species Insignificant loss/disruption of habitat critical to survival of a species Insignificant disruption to the breeding cycle of local population.	Significant decrease in local population size but no threat to overall population viability Significant behavioural disruption to local population Significant disruption to the breeding cycle of a local population Significant reduction in area of occupancy of species Significant loss of habitat critical to survival of a species Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a significant decline in local population is likely Introduce disease likely to cause a significant population decline.	Long term decrease in local population size and threat to local population viability Major disruption to the breeding cycle of local population Major reduction in area of occupancy of species Fragmentation of existing population Major loss of habitat critical to survival of a species Modify, destroy, remove, isolate or decrease availability of quality of habitat to the extent that a long term decline in local population is likely Introduce disease likely to cause a long term population decline.	Complete loss of local population Complete loss of habitat critical to survival of local population Wide spread (regional) decline in population size or habitat critical to regional population.	Complete loss of regional population Complete loss of habitat critical to survival of regional population.
	Physical Environment / Habitat Includes: air quality; water quality; benthic habitat (biotic/abiotic), particularly habitats that are rare or unique; habitat that represents a Key Ecological Feature[3]; habitat within a protected area; habitats that include benthic primary producers[4] and/ or epi-fauna[5]	No or negligible reduction in physical environment / habitat area/function.	Detectable but localised and insignificant loss of area/function of physical environment / habitat. Rapid recovery evident within ~ 2 years (two season recovery)	Significant loss of area and/or function of local physical environment / habitat. Recovery over medium term (2–10 years)	Major, large-scale loss of area and/or function of physical environment / local habitat. Slow recovery over decades.	Extensive destruction of local physical environment / habitat with no recovery Long term (decades) and wide spread loss of area or function of primary producers on a regional scale.	Complete destruction of regional physical environment / habitat with no recovery. Complete loss of area or function of primary producers on a regional scale.
	Threatened ecological communities (EPBC Act listed ecological communities)	No decline in threatened ecological community population size, diversity or function No reduction in area of threatened ecological community No introduction of disease likely to cause decline in threatened ecological community population size, diversity or function.	Detectable but insignificant decline in threatened ecological community population size, diversity or function Insignificant reduction in area of threatened ecological community.	Significant decline in threatened ecological community population size, diversity or function Significant reduction in area of threatened ecological community Introduction of disease likely to cause significant decline in threatened ecological community population size, diversity or function.	Major, long term decline in threatened ecological community population size, diversity or function Major reduction in area of threatened ecological community Fragmentation of threatened ecological community Introduce disease likely to cause long term decline in threatened ecological community population size, diversity or function.	Extensive, long term decline in threatened ecological community population size, diversity or function Complete loss of threatened ecological community.	Complete loss of threatened ecological community with no recovery.
	Protected Areas Includes: World Heritage Properties; Ramsar wetlands; Commonwealth/ National Heritage Areas; Land/ Marine Conservation Reserves.	No or negligible impact on protected area values No decline in species population within protected area No or negligible alteration, modification, obscuring or diminishing of protected area values.*	Detectable but insignificant impact on one of more of protected area's values. Detectable but insignificant decline in species population within protected area. Detectable but insignificant alteration, modification, obscuring or diminishing of protected area values*	Significant impact on one of more of protected area's values Significant decrease in population within protected area Significant alteration, modification, obscuring or diminishing of protected area values.	Major long term effect on one of more of protected area's values Long term decrease in species population contained within protected area and threat to that population's viability Major alteration, modification, obscuring or diminishing of protected area values	Extensive loss of one or more of protected area's values Extensive loss of species population contained within protected area.	Complete loss of one or more of protected area's values with no recovery Complete loss of species population contained within protected area with no recovery.
	Socio-economic receptors Includes: fisheries (commercial and recreational); tourism; oil and gas; defence; commercial shipping.	No or negligible loss of value of the local industry No or negligible reduction in key natural features or populations supporting the activity.	Detectable but insignificant short-term loss of value of the local industry. Detectable but insignificant reduction in key natural features or population supporting the local activity.	Significant loss of value of the local industry Significant medium term reduction of key natural features or populations supporting the local activity.	Major long-term loss of value of the local industry and threat to viability. Major reduction of key natural features or populations supporting the local activity.	Shutdown of local industry or widespread major damage to regional industry Extensive loss of key natural features or populations supporting the local industry.	Permanent shutdown of local or regional industry Permanent loss of key natural features or populations supporting the local or regional industry.

3 As defined by the Department of Agriculture, Water and Environment (DaWE)

4 Benthic photosynthetic organisms such as seagrass, algae, hard corals and mangroves

5 Fauna attached to the substrate including sponges, soft corals and crinoids.