wheatstone project start-up and operations environment plan

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1 environment plan summary

This *Wheatstone Project Start-up and Operations Environment Plan Summary* (Table 1-1) has been prepared from material provided in this Environment Plan (EP), and as required by Regulation 11(4) of the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009.

An EP Summary as required by Regulation 11(7) of the Western Australian Petroleum Pipelines (Environment) Regulations 2012 and the Petroleum (Submerged Lands) (Environment) Regulations 2012 has been prepared as a separate document and submitted to the WA Department of Mines, Industry Regulation and Safety (DMIRS).

Table 1-1: Environment Plan summary

Regulation	EP summary material requirement	Relevant section of the EP
11(4)(a)(i)	the location of the activity	Section 2.2, Section 3.1.1
11(4)(a)(ii)	a description of the receiving environment	Section 4, Ref. 1^
11(4)(a)(iii)	a description of the activity	Section 3
11(4)(a)(iv)	details of environmental impacts and risks	Section 6, Section 7
11(4)(a)(v)	a summary of the control measures for the activity	Section 6, Section 7
11(4)(a)(vi)	a summary of the arrangements for ongoing monitoring of the titleholder’s environmental performance	Section 8
11(4)(a)(vii)	a summary of the response arrangements in the oil pollution emergency plan	Section 7.3, Ref. 2*
11(4)(a)(viii)	details of consultation already undertaken, and plans for ongoing consultation	Section 2.6
11(4)(a)(ix)	details of the titleholder’s nominated liaison person for the activity	Section 2.4

^ *Available publicly at appendix d*
* *Available publicly at: https://docs.nopsema.gov.au/A748691*

2 introduction

2.1 Overview

Chevron Australia Pty Ltd (CAPL) has prepared this EP to document the assessment and management of potential environmental impacts and risks associated with start-up and operations activities of the Wheatstone Liquefied Natural Gas (LNG) Project (the Project).

The Project produces hydrocarbon fluids from offshore fields, transports these fluids through flowlines to the Wheatstone platform (the platform) for initial processing, and then transports gas and condensate through the trunkline to the onshore gas plant for further processing. Resultant LNG and condensate are exported by vessels to the international market, and gas is available to the domestic market via a tie-in with the existing Dampier to Bunbury Natural Gas Pipeline.

The start-up and operations activities detailed in this EP will be conducted in Commonwealth waters, WA State waters, and on the WA mainland, thus spanning more than one regulatory jurisdiction. This EP has been developed and submitted to the following regulators for assessment under their relevant jurisdictions:

- the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) for acceptance under the Commonwealth Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 (OPGGS(E)R)
- the WA DMIRS for approval under the WA Petroleum (Submerged Lands) (Environment) Regulations 2012 (PSLER), and the WA Petroleum Pipelines (Environment) Regulations 2012 (PPER).

2.2 Location

The platform will receive fluids for processing and subsequent transportation to the WA mainland via the trunkline. Fluid production will be from wells located in the Wheatstone (WA-46-L, WA-47-L and WA-48-L) and Iago (WA-46-L and WA-48-L) fields located off the Pilbara coast of WA (Figure 2-1). Additionally, the platform (WA-3-IL) will receive fluids from the Julimar Development Project (JDP) in WA-49-L, located southwest of WA-48-L, as described in the Woodside Energy Julimar Pty Ltd (Woodside) EP (Ref. 4).

Approximate water depths in the offshore licence areas within the scope of this EP are ~150–280 m for the Wheatstone field, and ~70–120 m for the Iago field. The platform is in water ~71 m deep, with centre coordinates of 19° 55′ 45.78″ S and 115° 23′ 02.22″ E.

The trunkline has sections in both Commonwealth waters (WA-25-PL) and State waters (TPL/25): the section from the platform to the State waters boundary, and then from the State waters boundary to the shore crossing through a microtunnel, respectively. The trunkline exits the microtunnel and remains buried onshore for ~1 km before emerging above ground just before the onshore endpoint (defined in Section 2.3) located upstream of the gas plant. Figure 2-2 shows the onshore trunkline section and the surrounding licence area PL99, which is included in the scope of this EP. The trunkline crosses the shore at Ashburton North, which is ~12 km southwest of Onslow, within the Shire of Ashburton, WA.

The trunkline generally extends along the outer continental shelf at ~110 m isobath, and crosses the shore through a microtunnel at Ashburton North, ~12 km south-west of Onslow on the Pilbara coast. The platform is ~50 km north of the Montebello Islands, while the trunkline is ~46 km west of Barrow Island and the Montebello Islands.

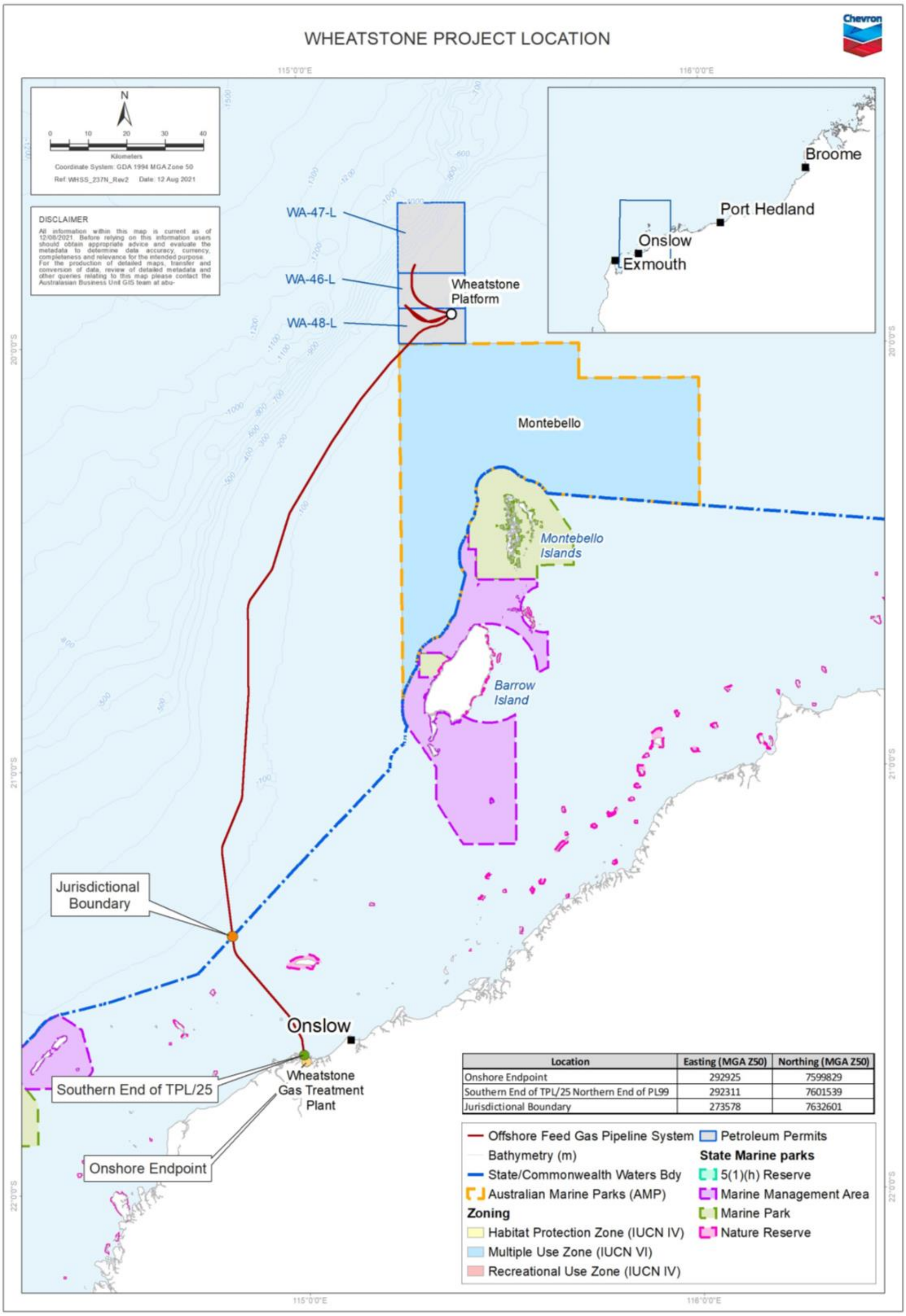


Figure 2-1: Project location

Figure 2-2: Onshore trunkline and licence area

2.3 Scope

2.3.1 In scope

This EP addresses start-up and operations activities associated with the Wheatstone and Iago hydrocarbon system and platform, which comprises:

- the Wheatstone and Iago field wells, trees, manifolds, flowlines, and umbilicals in WA-46-L, WA-47-L and WA-48-L, and all field subsea isolation valves (SSIVs) and flowline/umbilical risers at the platform
- the trunkline, from the platform to the onshore endpoint (WA-25-PL, TPL/25, PL99)
  - the onshore endpoint is the south-eastern terminus of the petroleum pipeline licence PL99 shown in Figure 2-2, which includes the trunkline and associated infrastructure such as the pig receiver station, flanges, and valves, which are upstream of the gas plant area (as outlined in the licence PL99)

The Wheatstone and Iago hydrocarbon system and platform are further described in Sections 3.2 and 3.3 respectively.

Specifically, this EP addresses the following activities associated with the Wheatstone and Iago hydrocarbon system and platform:

- start-up and operation of the Wheatstone and Iago hydrocarbon system (Section 3.2)
- start-up and operation of the platform infrastructure and facilities, including remote monitoring and operating from the central control room (CCR),

processing of all production fluids, platform maintenance, and well clean-ups to the platform (Section 3.3)

- inspection, maintenance, and repairs (IMR) of the Wheatstone and Iago hydrocarbon system (Section 3.4)
- long-term planning for decommissioning (Section 3.5)
- field support (Section 3.6)
  - this EP applies to vessels and vehicles directly involved in the petroleum activity once they enter the operational area (OA) until they exit from the OA
  - this EP also applies to helicopters performing petroleum activities at the platform, typically within 500 m.

In addition to fluids received from the Wheatstone and Iago hydrocarbon system, the platform will also receive third-party fluids from other fields, including the JDP field production system (WA-49-L and WA-26-PL). The JDP field production system includes the JDP wells, trees, manifolds, umbilicals and flowlines up to the platform riser inlet points (the flange that connects to the tie-in spool upstream of SSIV5 in Figure 3-1), located ~100 m from the platform and hereafter referred to as the JDP endpoint.

CAPL is not the registered titleholder for WA-49-L and WA-26-PL, and therefore, the JDP field production infrastructure upstream of the JDP endpoint is not included in the scope of this EP (refer to Section 2.3.2). However, the platform riser inlet infrastructure downstream of the JDP endpoint and the processing of JDP fluids on the platform have been considered in this EP. Further information on the operational interface with third-party assets is provided in Section 2.3.3.

2.3.2 Out of scope

The following summarises the facilities and activities that are not covered in the scope of this EP:

- facilities and activities associated with the JDP field production system in titles WA-49-L and WA-26-PL upstream of the JDP endpoint
  - in accordance with Regulation 9(1) of the OPGGS(E)R, Woodside, as titleholder for WA-49-L and WA-26-PL, will submit a separate JDP EP (Ref. 4) to NOPSEMA, addressing the impacts and risks associated with the start-up and operation of JDP field production system
- facilities and activities in WA-49-L and WA-26-PL associated with the gas plant downstream of the trunkline onshore endpoint
- activities associated with drilling and well completion, and well intervention activities for the Wheatstone and Iago wells completed in accordance with the NOPSEMA-accepted *Wheatstone Development Drilling and Completion Program Environment Plan*[1] (Ref. 5)
- activities associated with drilling, well completion, well intervention, and plug and abandonment activities for the Wheatstone and Iago wells which are covered under the NOPSEMA-accepted *Wheatstone Project: Wheatstone Well Intervention and Infill Drilling Environment Plan* (Ref. 6)

[1] Activities under this EP have been completed and the notification of completion has been accepted by NOPSEMA as per the requirements of Regulation 25A of the OPGGS(E)R.

- vessels (including emergency response vessels) transiting to or from the OA; these vessels are deemed to be operating under the Commonwealth *Navigation Act 2012* and not performing a petroleum activity
- end of facility life (EOFL) decommissioning and removal of infrastructure; these activities are not scheduled to occur within the 5-year in-force period of this EP (refer to Section 3.5.1).

2.3.3 Operational interface with third-party assets

A contract for services has been entered between CAPL as operator of the platform (WA-3-IL) and trunkline (WA-25-PL, TPL/25, PL99), and Woodside Energy Julimar Pty Ltd (Woodside) as operator of the Julimar-Brunello field (WA-49-L) and associated petroleum pipelines and flowlines (WA-26-PL) (collectively known as the JDP field production system). The contract regulates the operational interface between the JDP field production system and the platform by specifying field operating services, emergency response arrangements and communication and reporting requirements between CAPL and Woodside.

Under this contract for services, CAPL provides field operating services from the platform to Woodside which are necessary for the recovery of production fluids from the JDP field production system. The field operating services include, among other matters, operation and maintenance services for the JDP field production system from the platform. This includes operation and maintenance services for JDP subsea field infrastructure, wells, well jumpers, subsea wellheads, subsea manifolds, umbilicals and terminations, flowlines and subsea trees upstream of the JDP field production system endpoint. The contract also provides for Woodside to conduct vessel-based inspection, maintenance and repair of the JDP subsea field infrastructure. CAPL services provided under the contract include, for example:

- operation of all field production system controls, valves, chokes and safety devices and monitoring of all the field production system sensors, alarm and instrument data as required by manuals provided by Woodside and consistent with general direction given by Woodside
- operation of all safety shutdown devices
- performing inspections and tests related to the field production system in accordance with applicable laws and regulations
- integrity and production testing of the field production system, including the subsea trees and system valves, downhole safety valves and the opening of surface controlled subsurface safety valves (SCSSV) and SSIVs, as well as the testing of SCSSVs and SSIVs and monitoring and control of the SSIVs through the platform emergency shutdown system
- performing well tests (including pressure build-up tests and blowdown operations), monitoring well parameters and adjusting normal well parameters in accordance with Woodside’s operating manuals and applicable Wheatstone Platform manuals
- performing visual inspection of piping and equipment associated with the field production system and the route of the field production system at time intervals prescribed by applicable regulations.

CAPL will be given control of the JDP wells for the purpose of providing field operating services. Control of specific JDP wells will be transferred back to

Woodside during well workovers/interventions and internal well work. Handover of control of the field production system or individual wells is undertaken according to a handover process between CAPL and Woodside, which involves confirming the status of the wells and infrastructure, and the transfer of relevant records and test results (with a handover certificate) to ensure system integrity is appropriately maintained.

In the addition to the above field operating services, CAPL also provides emergency response and maintenance services to Woodside and has agreed associated communication and reporting requirements.

Under the contract, Woodside retains commercial responsibility for all field production system operations that are not performed by CAPL from or on the platform facility or which are not included in the field operating services provided by CAPL above.

These commercial arrangements do not alter the statutory obligations and responsibilities of the parties pursuant to the OPGGS Act and OPGGS(E)R.

2.3.3.1 Other third-parties

Over the life of the Project, other third-party drill centres may also deliver well production fluids to the platform. Should this occur, similar field operating agreements are expected to be implemented and associated activities and risks will be addressed in a separate EP or may trigger a review of this EP in accordance with Regulation 17 of the OPGGS(E)R.

2.4 Titleholder details

The titleholder details and nominated liaison person for this EP are listed in Table 2-1 and Table 2-2, respectively. Notification of change in details of a titleholder, liaison person, or contact information will be submitted to the relevant regulator via the appropriate means and timeframes specified in the regulations, in accordance with Section 8.3.2.2.

Table 2-1: Titleholder details

Titles	Details	Titleholders	Nominated Titleholder	Address
Commonwealth				
WA-3-IL	Infrastructure Licence (Platform)	Chevron (TAPL) Pty Ltd Woodside Energy Julimar Pty Ltd PE Wheatstone Pty Ltd Kufpec Australia (Julimar) Pty Ltd Kufpec Australia (Wheatstone Iago) Pty Ltd Kyushu Electric Wheatstone Pty Ltd	Chevron (TAPL) Pty Ltd (ACN: 081 647 047)	250 St Georges Terrace Perth, WA, 6000
WA-25-PL	Pipeline Licence (Trunkline–Commonwealth waters)			
WA-46-L	Production Licence	Chevron Australia Pty Ltd Chevron (TAPL) Pty Ltd	Chevron Australia Pty Ltd	250 St Georges Terrace Perth, WA, 6000
WA-47-L	Production Licence			

Titles	Details	Titleholders	Nominated Titleholder	Address
		PE Wheatstone Pty Ltd Kyushu Electric Wheatstone Pty Ltd	(ACN: 086 197 757)	
WA-48-L	Production Licence	Chevron Australia Pty Ltd Kufpec Australia (Wheatstone Iago) Pty Ltd Chevron (TAPL) Pty Ltd PE Wheatstone Pty Ltd Kyushu Electric Wheatstone Pty Ltd	Chevron Australia Pty Ltd (ACN: 086 197 757)	250 St Georges Terrace Perth, WA, 6000
State				
TPL/25	Pipeline Licence (Trunkline–State waters)	Chevron (TAPL) Pty Ltd Kufpec Australia (Julimar) Pty Ltd Kyushu Electric Wheatstone Pty Ltd PE Wheatstone Pty Ltd Kufpec Australia (Wheatstone Iago) Pty Ltd Woodside Energy Julimar Pty Ltd	Chevron (TAPL) Pty Ltd (ACN: 081 647 047)	250 St Georges Terrace Perth, WA, 6000
PL99	Pipeline Licence (Trunkline–State onshore)			

Table 2-2: Nominated liaison person

Name	Michael Stogner / Asten Roopra (public contact)
Company	Chevron Australia Pty Ltd
Position	Wheatstone Operations Manager / PGPA Operations Manager
Business address	250 St Georges Terrace, Perth WA, 6000
Telephone number	+61 8 9216 4000
Email	ABUEnvPlanInfo@chevron.com

2.5 Environmental management framework

CAPL's operations are managed in accordance with Chevron Corporation's Operational Excellence Management System (OEMS), which is described in Section 8.

2.5.1 Environmental policy

CAPL's commitment to environmental management in all aspects of operations is documented in Chevron Corporation's Operational Excellence (OE) Policy 530 (appendix a).

2.5.2 Legislative framework

The Commonwealth and State legislative framework relevant to the petroleum activities covered in this EP are summarised in Table 2-3 and Table 2-4 respectively. Standards, guidelines, international conventions, and agreements relevant to the petroleum activities are described in Table 2-5 and Table 2-6.

Table 2-3: Commonwealth legislative requirements

Legislation	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Australian Maritime Safety Authority Act 1990	Aims to promote maritime safety, protect the marine environment from pollution from ships or other environmental damage caused by shipping, and provide for a national search and rescue service	Requirements include the involvement of the Australian Maritime Safety Authority (AMSA) in response to relevant spill events	Roles and responsibilities are described in the Oil Pollution Emergency Plan (OPEP) (Ref. 2).
Biosecurity Act 2015 Biosecurity Regulations 2016	Provides biosecurity protection in Australian waters beyond territorial limits	Pre-arrival information must be reported through the Maritime Arrivals Reporting System (MARS) before arrival in Australian waters	Section 6.4.7
		Australian Ballast Water Management Requirements (Ref. 7)	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) EPBC Regulations 2000	Provides for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places	The EP must describe matters protected under Part 3 of the EPBC Act and assess any impacts and risks to these protected matters	Section 4, Section 6, and Section 7
		EPBC Regulations 2000 – Part 8 Division 8.1 Interacting with cetaceans	Section 6.4.2, and Section 6.4.6
		Injury or fatality caused to EPBC-listed fauna shall be reported	Section 8.4.2
Navigation Act 2012	Provides for vessel and seafarer safety, and marine pollution prevention	Notice to Mariners	Section 6.4.1, and Section 7.2
Navigation Act 2012 *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*	Gives effect to the requirements under the International Convention for the Prevention of Pollution from Ships	Marine order 30—Prevention of collisions	Section 7.2
		Marine order 91—Marine pollution prevention—oil	Section 6.4.8, Section 6.4.10, and Section 7.2

Legislation	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Protection of the Sea (Harmful Anti-fouling Systems) Act 2006 Various marine orders	(MARPOL 73/78) in Australia	Marine order 95—Marine pollution prevention—garbage	Section 6.4.8, Section 6.4.9
		Marine order 96—Marine pollution prevention—sewage	Section 6.4.8
		Marine order 97—Marine pollution prevention—air pollution	Section 6.4.4
		Marine order 98—Marine pollution prevention—anti-fouling systems	Section 6.4.7
National Greenhouse and Energy Reporting Act 2007 (NGER Act)	The NGER Act establishes the national scheme for the reporting of greenhouse gas emissions, energy production and energy consumption.	Greenhouse gas emissions, energy consumption and energy production from the platform will be reported under the NGER Act.	Section 6.2.2
Offshore Petroleum and Greenhouse Gas Storage Act 2006 (OPGGS Act) OPGGS Environment Regulations 2009 (OPGGS(E)R)	The OPGGS(E)R under the OPGGS Act requires a titleholder to have an accepted EP in place prior to commencement of a petroleum activity The regulations ensure petroleum activities are undertaken in an ecologically sustainable manner in accordance with an EP	An EP for a petroleum activity must be accepted by NOPSEMA before activities commence	This EP, including the OPEP (Ref. 2) and Operational and Scientific Monitoring Plan (OSMP) (Ref. 3)
OPGGS (Resource Management and Administration) Regulations 2011	These regulations require a titleholder to have an accepted Well Operations Management Plan (WOMP) in place The purpose of a WOMP is to ensure systems are in place to manage well integrity and well activities.	A WOMP for a petroleum well activity must be accepted by NOPSEMA before activities commence	WOMP (Ref. 8)
Underwater Cultural Heritage Act 2018	Provides protection for shipwrecks, sunken aircraft and other cultural heritage sites in Australian waters	Identification of the presence of protected cultural heritage sites and assessment of any impacts and risks to these sites	Section 4, Section 6, and Section 7

Table 2-4: Summary of applicable State legislation

Legislation	Description	Requirements relevant to the risks associated with the petroleum activity	Demonstration of how requirements are met
Biodiversity Conservation Act 2016 Biodiversity Conservation Regulations 2018	Provides for the conservation and protection of biodiversity and biodiversity components in Western Australia	The EP must describe matters protected under the BC Act and assess any impacts and risks to these protected matters	Section 4, Section 6, and Section 7
Environmental Protection Act 1986 (EP Act)	Provides for the prevention, control, and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement, and management of the environment	The Project was assessed through the EIS/ERMP assessment process under the EP Act and was approved by the WA Minister for Environment on 30 August 2011 by way of Ministerial Statement No. 873 (MS 873)	Where relevant, control measures and reporting requirements are consistent with requirements of MS 783 Section 6, and Section 7
Petroleum Pipelines Act 1969 PPER 2012	The PPER under this Act require an operator to have an accepted EP in place for any petroleum pipeline activity on State land	An EP for a petroleum activity must be accepted by DMIRS before activities commence	This EP, including the OPEP (Ref. 2), and OSMP (Ref. 3)
Petroleum (Submerged Lands) Act 1982 PSLER 2012	The PSLER under this Act require an operator to have an accepted EP in place for any petroleum activity in State waters The regulations ensure petroleum activities are undertaken in an ecologically sustainable manner in accordance with an EP	An EP for a petroleum activity must be accepted by DMIRS before activities commence	This EP, including the OPEP (Ref. 2), and OSMP (Ref. 3)
Pollution of Waters by Noxious Substances Act 1987	Protects State waters and other waters under WA jurisdiction from pollution by oil and noxious substances	This Act gives effect to MARPOL 73/78 Annex I and II and sets measures to respond to spills	Section 6.4.8, Section 7.2, and OPEP (Ref. 2)

Table 2-5: Standards and guidelines

Standard / guideline	Description
Control and Management of Ships' Biofouling to Minimize the	International Maritime Organization (IMO) guidelines for global management of biofouling. This guideline requires a

Standard / guideline	Description
Transfer of Invasive Aquatic Species (Ref. 9)	biofouling management plan and record book to be available and maintained
National Light Pollution Guidelines for Wildlife, including Marine Turtles, Seabirds and Migratory Shorebirds (Ref. 10)	Outlines the process to be followed where there is the potential for artificial lighting to affect wildlife; applies to new projects, lighting upgrades and where there is evidence of wildlife being affected by existing artificial light.

Table 2-6: International agreements and conventions

Convention / agreement / code of practice	Applicability to the petroleum activity
Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Ref. 11)	Provides a framework for water resource management, and states specific water quality guidelines for environmental values and the context within which they should be applied.
International Convention for the Prevention of Pollution from Ships (MARPOL)	Designed to reduce pollution of the marine environment from ships, including operational discharges (e.g., sewage, oil, garbage, air emissions) and accidental causes. MARPOL currently includes six technical Annexes. MARPOL is enacted in Australia through the Commonwealth *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* and the *Navigation Act 2012*.
International Convention for the Control and Management of Ships' Ballast Water and Sediments	Aims to prevent the introduction of marine organisms to new regions and environments. Australia is party to the convention and has developed the *Australian Ballast Water Management Requirements* (Ref. 7) consistent with the requirements of the Convention. The Australian Ballast Water Management Requirements are enforceable under the Commonwealth *Biosecurity Act 2015*.
Convention of the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)	This convention aims to improve the status of all threatened migratory species by national action and international agreements between range states. Species covered by these agreements are subject to protection under the EPBC Act.
Bilateral migratory bird agreements: • Japan–Australia Migratory Bird Agreement (JAMBA) • China–Australia Migratory Bird Agreement (CAMBA) • Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)	These agreements recognise international concern for the protection of migratory birds and birds in danger of extinction. Species covered by these agreements are subject to protection under the EPBC Act.

2.6 Stakeholder consultation

2.6.1 Methodology

CAPL followed the following process to undertake consultation for this petroleum activity:

- identify relevant stakeholders
- provide sufficient information to enable stakeholders to understand how this activity may affect their functions, interests, or activities
- assess the merit of any objections or claims raised by the stakeholders

- provide a response to the objection or claim, and ensure this is captured in the EP.

This methodology was developed with guidance sourced from:

- NOPSEMA's *Environment plan decision making* guideline (Ref. 12)
- NOPSEMA's *Clarifying statutory requirements and good practice consultation* bulletin (Ref. 13)
- NOPSEMA's *Consultation with Commonwealth agencies with responsibilities in the marine area* guideline (Ref. 14)
- NOPSEMA's *Considerations for five-year environment plan revisions* information paper (Ref. 15)
- DMP's *Guideline for the development of petroleum and geothermal environment plans in Western Australia* (Ref. 16)
- Australian Petroleum Production and Exploration Association's (APPEA's) draft *Stakeholder Consultation and Engagement Principles and Methodology for Environment Plans* (Ref. 17).

A process for ongoing consultation is described in Section 2.6.5.

2.6.2 Identification of relevant stakeholders

Establishing relevance under the OPGGS(E)R, PSLER, or the PPER depends on the nature and scale of the petroleum activity and its associated impacts and risks.

A 'relevant person' is defined as:

- each department or agency of the Commonwealth to which the activities to be carried out under the EP, or the revision of the EP, may be relevant
- each department or agency of a State or the Northern Territory to which the activities to be carried out under the EP, or the revision of the EP, may be relevant
- the department of the responsible State Minister, or the responsible Northern Territory Minister
- a person or organisation whose functions, interests, or activities may be affected by the activities to be carried out under the EP, or the revision of the EP
- any other person or organisation that the titleholder considers relevant.

With regards to Commonwealth agencies, advice provided in the NOPSEMA guideline (Ref. 14) has been taken into consideration in identifying relevance with respect to the activities provided for in this EP.

With regards to "a person or organisation whose functions, interests, or activities may be affected by the activities to be carried out under the EP, or the revision of the EP", NOPSEMA (Ref. 13) has provided the additional clarifications:

- that there must be a direct connection between the activities that an EP provides for and a potential effect to a person or organisation functions, interests, or activities, for them to be considered as a 'relevant person'

- that the definition of "the activities to be carried out" is limited to the conduct of the activity that is provided for in the EP and does not extend to a hypothetical, remote or speculative consequence from an activity such as a major oil spill.

Based on the impact assessment undertaken in this EP, CAPL understands that the impacts of the planned activities are limited to the vicinity of the OA, thus persons or organisations directly connected with functions, interests, or activities within the OA have been taken to be relevant.

Since commencing the Project, CAPL has developed and maintained a list of stakeholders who are considered relevant. CAPL engaged with stakeholders in 2014/2015 before commencing start-up and operations activities associated with the Project and submission of the original version of this EP. This list has been reviewed to ensure that any new 'relevant person' is also included in the stakeholder consultation process as part of this current 5–year revision to the EP. For this 5–year EP revision, CAPL have also elected to use the Western Australian Fishing Industry Council's (WAFIC) oil and gas consultation service to help determine relevant commercial fisheries and fishers as well as review and distribute fishery-specific consultation material. The relevant stakeholders identified for consultation as part of this EP are listed in Table 2-7.

Table 2-7: Relevant stakeholders

Group	Stakeholder
Commonwealth departments or agencies	• Australian Fisheries Management Authority (AFMA) • Australian Hydrographic Office (AHO) • Australian Maritime Safety Authority (AMSA) • Department of Agriculture, Water and the Environment (DAWE) – Biosecurity – Fisheries • Department of Defence / Border Force
State departments or agencies	• Department of Biodiversity, Conservation and Attractions (DBCA) • Department of Primary Industries and Regional Development (DPIRD) • Department of Transport (DoT) • Department of Mines, Industry Regulation and Safety (DMIRS)
Commonwealth fisheries (peak bodies)	• Australian Southern Bluefin Tuna Industry Association • Commonwealth Fisheries Association • Tuna Australia • Western Australian Fishing Industry Council (WAFIC) • Pearl Producers Association • Bilyara Holdings Mackerel Area 2 License Holder
Commercial fisheries	• West Coast Deep Sea Crustacean • Mackerel Managed Fishery (Area 2) • Onslow Prawn Managed Fishery • Pilbara Crab Managed Fishery • Pilbara Line Fishery • Pilbara Trap Managed Fishery • North West Slope Trawl Fishery • Western Tuna and Billfish Fishery

Group	Stakeholder
Recreational fisheries	• RecFishWest • Marine Tourism WA • Ashburton Anglers • Apache Charters • Blue Juice Charters • Blue Lightning Fishing Charters • Mahi Charters • Exmouth Deep Sea Fishing • Western Boat Charters (formerly Heron Charters) • Montebello Island Safaris • Pelican Charters • Point Samson Charters • Top Gun Charters • Exmouth Game Fishing Club • Nickol Bay Sport Fishing Club • Onslow Visitor Centre • Port Hedland Game Fishing Club
Other petroleum operators	• Santos Ltd • Woodside Burrup Pty Ltd • Eni Australia Ltd
Emergency response	• AECOM • Australian Marine Oil Spill Response Centre • Gorgon HSE / Emergency Management Specialists • DoT Oil Spill Response Coordination Unit • Oil Spill Response Limited • BMT • GHD • Cleanaway • Port Authorities
Aboriginal	• Buurabalayji Thalanyji Aboriginal Corporation (BTAC) • Robe River Kuruma Aboriginal Corporation • Wirrawandi Aboriginal Corporation RNTBC Native Title body for Yaburara and Coastal Mardudhunera Aboriginal Corporation (YACMAC) • Yamatji Marlpa Aboriginal Corporation
Local	• Shire of Ashburton • Onslow Chamber of Commerce and Industry • Onslow Community Reference Group • Onslow Salt

2.6.3 Provision of material

Stakeholders must be provided with sufficient information to enable them to understand how a petroleum activity may affect their functions, interests, or activities.

CAPL sent a detailed fact sheet to stakeholders between May and August 2021—this fact sheet summarised the activity, aspects, and the proposed control measures to manage impacts and risks. WAFIC was also used to convey an additional factsheet, tailored for the commercial fishing sector during May 2021.

Where further time was required to determine appropriate stakeholder contact details, an additional round of engagements was conducted on 28 July 2021 with two Aboriginal representative bodies and Onslow Salt.

A copy of the consultation materials is included in appendix b.

All records and responses from relevant persons were included in a sensitive information report provided separately to NOPSEMA and DMIRS to preserve the privacy of those persons or organisations consulted. Specifically, these records and responses were considered to contain personal information (as defined by the Commonwealth *Privacy Act 1988*) or information that at the request of the relevant persons are not to be published as per Regulation 11(A) of the OPGGS(E)R.

2.6.4 Assessment and response

No objections or claims about adverse impacts relating directly to the petroleum activities covered in this EP were raised by relevant stakeholders during previous (2014/2015) or recent (2021) consultation.

A record of all consultation undertaken specifically for this activity is included in the stakeholder engagement log, which has been provided in the sensitive information report sent separately to NOPSEMA and DMIRS.

2.6.5 Ongoing consultation

The stakeholder notifications and ongoing consultation required for this petroleum activity is captured in Table 2-8.

Any objections or claims arising from ongoing consultation that have merit and have the potential to result in changes to the description of environment, impact or risk assessment, or control measures, will be subject to CAPL's Management of Change (MoC) process, in accordance with Section 8.3.2.2.

Table 2-8: Notifications and ongoing consultation

Stakeholder	Notification or ongoing consultation requirement	Timing	Frequency
AHO	Provide information to enable promulgation of Notice to Mariners Notify AHO via datacentre@hydro.gov.au	At least four working weeks before commencing activities or as otherwise agreed with AHO	As required
AMSA	Provide information to enable promulgation of radionavigation warnings Notify AMSA's JRCC via rccaus@amsa.gov.au (phone: 1800 641 792 or +61 2 6230 6811)	24 to 48 hours before commencing activities or as otherwise agreed with AMSA	As required
WAFIC	To inform of changes to activities or impacts/risks occurring that may affect fisheries Notify WAFIC via oilandgas@wafic.org.au	Prior to new or significant changes to activities or impacts/risks occurring	As required

Stakeholder	Notification or ongoing consultation requirement	Timing	Frequency
Interested parties, potentially affected parties, government agencies including: • DNP • DMIRS	CAPL to advise of any new or significant changes to activities or impacts/risks within the scope of the EP, following an evaluation as per Section 8.3.2.2, that may potentially impact marine users	Prior to new or significant changes to activities or impacts/risks occurring	As required

2.6.5.1 Stakeholder consultation in the event of an emergency

In the event of an emergency spill event, CAPL will immediately conduct oil spill trajectory modelling using the actual inputs associated with the spill event to predict trajectory, as described in the OPEP (Ref. 2).

Once oil spill trajectory modelling is completed, CAPL will start engaging with potentially affected stakeholders (those considered relevant from Table 2-7 and any others identified from the oil spill trajectory modelling). The process for reaching out to these stakeholders includes direct contact (phone or email) or indirect contact via the CAPL website.

3 description of the petroleum activity

3.1 Overview

Offshore infrastructure will produce and transport fluids (comprising gas, condensate, and produced water) from the subsea wells to the platform via subsea flowlines. The gas and condensate are dehydrated and dewatered at the platform, and then the dry gas and condensate are routed through the trunkline to the onshore endpoint.

The description of the petroleum activity is presented in the following sections:

- start-up and operation of the hydrocarbon system—includes the infrastructure (wells, flowlines, and trunkline) used for gathering and transporting hydrocarbon to the platform and the onshore end point; and other supporting infrastructure (umbilicals, pipelines, etc.) (Section 3.2)
- start-up and operation of the platform—includes various hydrocarbon processing and utility systems, as well as accommodation facilities, central control room (CCR), and helideck (Section 3.3)
- IMR—undertaken to ensure the integrity of the hydrocarbon system (Section 3.4)
- decommissioning— long-term planning for decommissioning of redundant infrastructure (Section 3.5)
- field support—includes the use of platform supply vessels, IMR vessels, and helicopters for personnel transfers (Section 3.6).

3.1.1 Operational area

The location of the petroleum activities are described in Section 2.2 and shown in Figure 2-1 and Figure 2-2.

The OA for the petroleum activity is defined as the petroleum titles (WA-46-L, WA-47-L, WA-48-L, WA-3-IL, WA-25-PL, TPL/25, PL99) plus a 200 m wide corridor centred over the trunkline within Commonwealth and State waters. It is within this OA that the petroleum activity defined within Section 3 of this EP will be undertaken.

3.1.2 Timing

CAPL is currently operating the Wheatstone and Iago hydrocarbon system and platform, which is expected to be operational for ~30 years. IMR activities may occur at any time during operations. Activities covered by this EP can occur 24 hours a day and 7 days a week.

Any introduction of new reservoir fluids from third-party fields to the system will include a start-up phase expected to last between approximately six months and two years from the time fluids are produced from the wells. This timing and duration is indicative, dependent, in part, on success of well-start up and onshore facilities' demands, and thus is subject to change.

3.2 Hydrocarbon system

3.2.1 Infrastructure

The hydrocarbon system includes the infrastructure for gathering and transporting hydrocarbons from the offshore production wells to the platform for processing, and then transferring the hydrocarbons to the onshore endpoint via the trunkline (Figure 3-1).

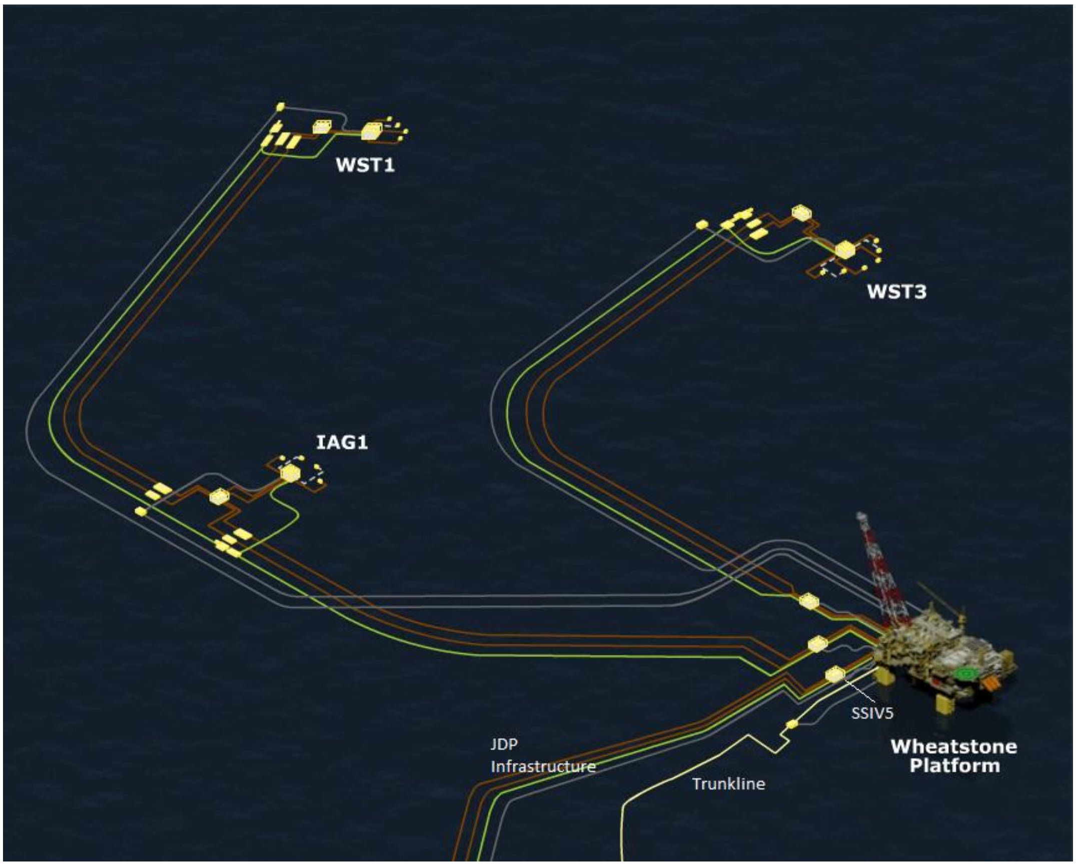


Figure 3-1: Schematic layout

3.2.1.1 Wells and trees

The Project involves a phased development of the drill centres. To deliver targeted production rates during the early years of operations, production occurs from nine Wheatstone and Iago wells (from the three drill centres WST-1, WST-3, IAG-1).

Each well includes a subsea tree structure connected to a central manifold structure in each drill centre. The operation and monitoring of the Wheatstone and Iago wells and trees are described further in Section 3.2.2.1.

The Wheatstone and Iago subsea well design includes a permanent downhole gauge to facilitate the downhole measurement of pressure and temperature, and a downhole safety valve. The subsea wells system comprise a tubing head spool, and a tree including the subsea control module.

The wells have been designed in accordance with CAPL standards and accepted industry practice, as detailed in the WOMP (Ref. 8). The WOMP demonstrates requirements in relation to well design and integrity are implemented. In accordance with Regulation 31 of the OPGGS(E)R, specific well design and integrity measures are not detailed within this EP; this information has previously been provided to NOPSEMA under the Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011.

3.2.1.2 Flowlines and pipelines

Each group of wells is connected to the platform by the flowlines and pipeline system[2]. The system transports production fluids from the wells to the platform through the production flowlines, and transports monoethylene glycol (MEG) or other chemicals (e.g., scale inhibitor) from the platform to the subsea system through pipelines. For the purposes of this EP, the jumpers, spools, and risers are collectively referred to as part of the flowlines and pipeline system.

3.2.1.3 Umbilicals

Umbilicals are parallel to the flowlines and pipeline system, and carry electrical power and hydraulic fluids to operate and control the manifolds and trees, and cabling to transmit signals. Steel and electrical flying leads are connected from the manifold to the wells, and for the purposes of this EP, are collectively referred to as umbilicals.

3.2.1.4 Subsea valves

3.2.1.4.1 Control valves

The subsea control system includes various production control valves on the trees, manifolds, and pipeline termination structures (PTSs), remotely operated from the platform CCR, which when actuated, release control fluids (further described in Section 3.2.2.3).

3.2.1.4.2 Isolation valves

SSIVs are installed on all incoming hydrocarbon flowlines and the export trunkline to isolate the subsea inventories in the unlikely event of an unplanned release. The SSIVs are located on the seabed, ~70 m away from the platform. SCSSVs are part of the well infrastructure, while riser emergency shutdown valves (RESDVs) are provided for each incoming flowline and the trunkline (included as part of the platform infrastructure description, Section 3.3). The valves can be closed via a dedicated pushbutton in the CCR, or can close automatically (failsafe) on emergency shutdown scenarios as described in the Wheatstone Facilities Safety Cases (Ref. 18; Ref. 19) and summarised in the platform central control description (Section 3.3.2.9).

3.2.1.5 Trunkline

The trunkline, which is ~221 km long and ~44 inches in diameter, transports the commingled dry gas and condensate from the platform to the onshore facility. The trunkline crosses other pipelines including Pluto, Jansz, and Gorgon in Commonwealth waters, and Roller Skate in State waters.

State waters and onshore

The State waters section of the trunkline is ~37 km long, begins at the State waters boundary, and includes trenched, stitch-rockdumped, and buried sections as it enters the shore approach into the microtunnel. The trunkline has been

[2] The production lines are classified as flowlines; the MEG and utility lines are classified as pipelines.

stabilised by a combination of pre-lay trenching with backfill and rock dump in State waters. The shore crossing microtunnel is ~1.2 km long, is supported by a concrete casing, and is routed up to the onshore beach valve. The subsea entry point (the offshore end) and the onshore end of the microtunnel are grouted with grout plugs.

The onshore trunkline section includes an ~1 km section between the microtunnel and the pig receiver station, upstream of the gas plant, and is shown in Figure 2-2. The onshore trunkline section is buried, either lying in between berms backfilled with soil, or trenched and backfilled. The embankment slopes are protected by rock and covered by a crushed rock surfacing. The onshore section includes the beach valve, pig receiver station and associated valves, and includes the adjacent area within the licence PL99.

3.2.2 Start-up and operations

3.2.2.1 Wells and trees

The platform CCR (Section 3.3.2.9) provides remote operation and monitoring of the hydrocarbon system, including various parameters such as flow, temperature and pressure. Well integrity is managed by continuous surveillance, monitoring and periodic IMR of the wells to ensure infrastructure and operations are within pre-established safe limits. The systems and processes associated with managing the integrity of the Wheatstone and Iago wells are documented in the WOMP (Ref. 8).

3.2.2.2 Flowlines and trunkline

Typically, new flowlines are nitrogen filled and this will be purged to the platform flare system during initial start-up.

3.2.2.3 Subsea valves

Control of the hydrocarbon system includes the use of valves on the manifolds, trees, and PTSs via the umbilicals. Small quantities of control fluids are discharged from subsea valve actuations. The frequency of valve actuations may range from less than daily to up to several times a day for each valve, are non-continuous and of short duration (e.g., less than a minute). Discharge volumes are expected to range from 0.001–0.03 m^3 per discharge, with predicted total volumes from any tree or manifold expected to be ~1–5 m^3 per year, equating to a total of ~15–70 m^3 per year (for the three drill centres and nine wells covered in this EP).

3.3 Platform

3.3.1 Infrastructure and facilities

The platform dehydrates and dewaters the production fluids received from the Wheatstone and Iago hydrocarbon system and third-party field production systems, before transferring the dry gas and condensate into the trunkline. To achieve this, the platform includes various hydrocarbon processes, utility, and support systems to separate the gas from liquids, to dry the gas, and dewater the condensate. The hydrocarbon system operations are controlled from the platform.

The platform typically accommodates ~96 people on board (POB) during normal operations; and can accommodate up to 104 POB.

Safety and navigational lighting, as well as emergency lighting, illuminates the platform. Two pedestal cranes transfer and handle supplies and equipment, such as portable tanks for production chemicals, while bunkering hoses are used for MEG, tri-ethylene glycol (TEG), diesel, and potable water. Each crane pedestal stores ~135 m^3 of diesel. Laboratory facilities are provided for various analyses. A helideck is used for personnel transfer. The lower deck of the topsides is ~28 m above sea level.

3.3.2 Start-up and operations

3.3.2.1 Platform hydrocarbon processing

The following sections describe the hydrocarbon processing system on the platform and are indicative of normal operations. Where conditions differ from normal operations (potentially through well clean-up, well testing, start-up and commissioning processes), these differences are noted, where relevant. The normal production rate for the platform is ~1,700–2,100 million standard cubic feet per day (MMscfd).

3.3.2.2 Compression

As the reservoir depletes and the pressure within it is reduced, the compression system will ensure production targets are met. Two high efficiency open-cycle aero derivative gas turbines will supply the required compression duty for the platform. Reservoir predictions indicate that compression can be bypassed initially (free-flow), before switching to partial compression with one compressor operating at part load. In the longer term (estimated to commence ~10 years post start up) full compression, involving both compressors running, will be required. Compressors may also be used for periods during start-up processes.

3.3.2.3 Flare system

The platform has two safety-critical flare systems for the disposal of flammable gases—a high-pressure (HP) flare for high-pressure process upset, relief, and blowdown loads, and a low-pressure (LP) flare operating continuously to dispose of low-pressure waste gas from the process.

Waste gas streams routed to the LP flare on a continuous basis include:

- produced water system offgas
- TEG regeneration offgas
- stripping gas
- closed drains drum offgas
- compressor dry seals gas.

These waste streams (particularly the produced water system and TEG regeneration system offgas (when stripping is not required) will be mainly inert, having a high water and carbon dioxide content (Ref. 20).

The HP flare header disposes of hydrocarbons from the following streams:

- subsea flowline depressurisation
- field and individual flowline re-start
- system pressure relief and blowdown

- discharge from separators during overpressure scenarios.

The flare stack includes a constantly lit pilot, to prevent the need for cold venting, and purge gas will be sent to the flare to prevent oxygen ingress. Fuel gas will be the primary purge gas for the LP flare, whilst nitrogen will be the primary purge gas for the HP flare.

During well clean-up, initial start-up, and operational start-ups at the platform, additional HP flaring may be required until the systems are commissioned, have stabilised, and the required stream compositions and process conditions are met. Shutdowns (equipment, isolation, and depressurisation) during operations will also deliver gas through the flares.

3.3.2.4 Power generation

Power is generated by three high efficiency aero derivative gas turbines, with waste heat recovery provided by a hot oil system. The units are dual-fuelled, to allow diesel operation in case of loss of fuel gas. The turbine generator configuration is 3 × 50% rated (typically two operating, one spare). Additionally, an emergency diesel generator and a black-start generator are available for power generation, and temporary generators may also be used.

3.3.2.5 Chemical injection

A number of chemicals are used in the topsides processing system and subsea system. The chemicals typically required include: MEG (topsides and subsea); TEG (topsides); corrosion inhibitor (trunkline, J tubes and tempered water); scale inhibitor (subsea); demulsifier (topsides); reverse demulsifier (topsides); antifoam (topsides); biocide (topsides slops tank, fuel storage, J tubes and tempered water); sodium hypochlorite, water clarifier and calcite (topsides); pH buffer and alkalinity adjustment (topsides and MEG riser subsea); MEG oxygen scavenger (topsides); methanol, which may be used to prevent hydrates in future operations (subsea). These chemicals are generally used in reactions in the production process, or, in the case of TEG, used on the topsides for dehydration, and MEG, regenerated. Sodium hypochlorite is generated on the platform by the electrolytic decomposition of sea water, and minor quantities are injected into various piping, tanks, systems, and caissons to control and minimise marine growth.

3.3.2.6 Produced water treatment

Produced Water (PW) brought up from the hydrocarbon-bearing strata during the extraction of gas and condensate from the wells is physically separated from the well fluids at the platform, treated through a tiered treatment system, and discharged to the ocean through a caisson ~45 m below the lowest astronomical tide (LAT).

The treatment system includes primary treatment using hydrocyclones and a secondary treatment system comprising induced gas flotation (IGF) units with fuel gas injection. A slipstream can also be sent to a tertiary treatment system, comprising an organoclay filter for hydrocarbon adsorption, before recombining with the secondary treatment effluent and discharge through the PW caisson. The platform is designed to process up to ~265 m^3/h of PW.

Well clean-up

Upon the initial flow from each well to the platform, MEG is injected and the MEG/PW mix will contain traces of residual contaminants from previous drilling activities, requiring clean-up at the platform.

Typically, MEG received back to the platform as a result of unplanned shutdown and restart will be collected in the rich MEG tank and regenerated. However, during well clean-ups this is not possible due to the presence of drilling completion fluids. During these periods MEG/PW mix is treated through the PW treatment system or equivalent (such as a temporary treatment package containing infrastructure such as filtration, coalescers and carbon adsorption beds) and discharged via the produced water caisson.

3.3.2.7 Water and wastewater systems

Seawater system and cooling water

Seawater is drawn by seawater lift pumps located in the seawater lift caissons and used as: a cooling medium for heat exchange within the closed-loop tempered water circuit; source water for potable water generation; make-up firewater; and source water for generating the sodium hypochlorite solution. Seawater is continuously injected with hypochlorite to prevent biofouling of the facilities that are exposed to seawater. Cooling water (CW) from the seawater system is discharged through a caisson ~40 m below LAT. Reverse osmosis (RO) units produce potable water from sea water and the rejected brine is discharged through a caisson.

Sewage treatment

The platform sewage treatment unit is designed to treat sewage (with added greywater for system optimisation) generated by POB. The unit includes maceration, before discharging the wastewater ~40 m below LAT through a sewage discharge caisson.

Food waste

The kitchen waste system includes a macerator, with discharges to the ocean through a dedicated discharge pipe, ~40 m below LAT. Alternatively, food waste may be taken to shore for disposal.

Drains system

The open drains system collects deck drainage (firewater, stormwater, and washdown water), drip trays, and sample returns. Non-contaminated streams (such as rainwater from the roof of the living quarters) are sent directly to the open drains caisson. Potentially contaminated streams are routed to the slops tank, where they undergo coarse oil-in-water (OIW) separation, with the water being sent to a coalescer for further oil removal, then through the open drains caisson. Oil from the slops tank is reprocessed or taken as waste from the platform.

For high water flows beyond the capacity of the slops tank (e.g., storm or firewater deluge), the first flush is recovered to the slops tank but thereafter overflows directly to the open drains caisson (after the first flush, the drainage water is considered to be uncontaminated drainage water). The open drains system will also collect a degree of deluge.

The closed drains system collects hazardous wastes from the processing system and routes the hazardous waste to the closed drains drum. The closed drains system also drains and collects liquids from equipment and piping during maintenance. Condensate is recovered to the process system and collected water is directed to the PW treatment system.

3.3.2.8 Fire systems

The fire and gas system is used for detecting hydrocarbon gas and fire, and fires associated with non-process utilities, such as diesel, hot oil, lube/mineral oil, and transformer oil. Detectors include hydrogen gas detectors, flame detectors, smoke detectors, and heat detectors. The active fire protection system components include the firewater system, as well as deluge system, hose reels and extinguishers, and fire suppression systems. Fire-fighting foam is used to dose the firewater system. The open drains system has been sized to contain the first flush of firewater deluge, including the foam. During maintenance, the fire system will be tested several times per year resulting in some foam being discharged through the grated decks to the ocean. To ensure the firewater system is maintained in working order and chlorine levels are adequate to minimise fouling within the system, chlorine is injected and water within the system is flushed regularly resulting in discharge of chlorinated water.

3.3.2.9 Central control

Control and monitoring

The hydrocarbon system is controlled and monitored from the platform CCR. All subsea system process valves and instrumentation functions required to carry out production operations are operated by remote control from the platform CCR. Remote operation can also occur from the onshore plant if required.

In the CCR, various production data are monitored from probes and other equipment at the wells, trees, flowlines, and platform hydrocarbon processing systems. This monitoring can include process conditions, flow rates, pressure, temperature, sand production, erosion rates, and subsea and topsides systems equipment integrity and operational status. Well conditions and general integrity of the wells can be determined through the monitoring of downhole and tree-mounted instrumentation data at the CCR.

Shutdowns

Emergency shutdowns of the platform and hydrocarbon system (including individual wells and flowlines) can be activated automatically from trips and emergencies, or by CCR pushbutton, as per the Safety Case (Ref. 18; Ref. 19). Inventories are isolated through valve closures (at the well SCSSVs, flowlines SSIVs, and platform RESDVs) and equipment in process areas of the platform are also isolated through shutdown valves.

Individual equipment shutdowns can also occur at the platform if individual equipment items/packaged equipment are tripped when operating conditions outside design limits are detected. The equipment shutdown condition is activated automatically by the process or cascaded from a higher level shutdown.

If a trunkline release is confirmed, the platform could be shutdown, wells shut in, and the trunkline depressurised to the LNG Plant, through the production trains and/or blowdown via the onshore flare.

3.3.2.10 Platform maintenance

Platform maintenance preserves the safety, reliability, and integrity of the facility and maintains efficient conditions. Maintenance and inspection activities are extensive, and include risk-based inspection (RBI), predictive maintenance, condition monitoring, and generic maintenance. Maintenance on the platform is wide-ranging and can include breaking containment of vessels, opening lines, topping up and changing over fluids, draining water systems, testing valve function, changing filters, localised surface abrasive blasting and painting, general cleaning, and pressure cleaning.

3.4 Inspections, maintenance, and repairs

Any disturbance related to IMR activities will be contained within the Trunkline Direct Disturbance Footprint per MS 873 conditions or the OA defined in this EP. Upstream of the platform, a marine disturbance footprint of 100 m (50 m either side of pipeline centre line) is not expected to be exceeded during IMR activities.

3.4.1 Subsea

Section 572(2) of the OPGGS Act requires a titleholder to maintain in good condition and repair all structures, equipment, and other property (hereafter collectively referred to as 'property') that is within the title area and is used in connection with the operations authorised by the title.

IMR is undertaken to ensure that the integrity of the hydrocarbon system is maintained at or above acceptable standards. IMR activities may occur at any time during operations, including during start-up and operations.

The intent of Section 572(2) relates to ensuring that property is fit for purpose and is able to be removed when neither used, nor to be used, in connection with the operations (Ref. 21).

Subsea IMR typically requires the support of a vessel; these vessel operations are covered within Section 3.6.1.

3.4.1.1 Inspections

Subsea inspections provide assurance that infrastructure is being maintained and operated according to design and proactively identify maintenance or repair activities that may be required. Inspection generally involves the use of a vessel travelling along the route of the subsea system with an autonomous underwater vehicle (AUV) or remotely operated vehicle (ROV) (and in some cases, divers).

Inspections will be undertaken in accordance with the *Wheatstone Upstream Subsea System Inspection and Monitoring Plan* (Ref. 22) and *Wheatstone Upstream Trunkline System Inspection and Monitoring Plan* (Ref. 23). Inspections are typically conducted more frequently (e.g., one to three years) during early operations, with the frequency likely to decrease over time during steady-state operations, depending on previous inspection results. Inspection techniques may include:

- visual inspections—may involve ROVs or AUVs deployed from a vessel; may also involve divers and a dive support vessel
- marine acoustic surveys—may include the use of side-scan sonar (SSS) and multibeam echo sounders (MBES), and are typically done from a vessel using towed acoustic instruments, ROVs, or AUVs
- non-destructive testing—may include ultrasonic testing and electrical resistance testing, which are typically undertaken using an ROV or AUV deployed from a vessel
- cathodic protection measurements—are completed using ROVs or AUVs and conductivity probes or by making visual assessments of anode wastage

- fatigue monitoring/inspection—where required, fatigue monitoring equipment will be installed, inspected, and/or retrieved by a ROV deployed from a vessel.

Intelligent pigging (IP) may be used to inspect the trunkline condition. Conditioning (cleaning or batch) pigging is typically required before an IP inspection run and requires a pig to sweep any debris and gauge the pipeline to ensure that the pipeline is in suitable condition for a subsequent IP inspection. Batch pigging may also be required to distribute chemicals (e.g., corrosion inhibitor). Pigs are launched from the platform through the trunkline to the onshore pig receiver. Tethered IP may be used to inspect the MEG risers for integrity management due to the inability to externally inspect areas of concern. In exceptional circumstances, pigging may also be conducted on the flowlines, with temporary pig launchers used on the flowlines and pigs received at the platform.

3.4.1.2 Maintenance and repair

Maintenance and repair activities, including equipment change-out, will be conducted during the operational life of the Project to:

- prevent deterioration and/or failure of infrastructure
- maintain reliability and performance of infrastructure
- ensure infrastructure is adequately maintained to enable the potential for future removal.

Maintenance and repair activities are typically conducted in response to inspection findings, engineering analyses, and/or external events. The activities are likely to be performed by ROV from the IMR vessel (or similar) used for inspections, or in exceptional circumstances may require the use of a larger vessel. IMR activities may involve the occasional subsea discharge of small quantities of fluids (typically MEG, hydraulic fluids, or well fluids) and/or minor seabed disturbances.

There are no planned interventions downstream of the platform (i.e., along the trunkline between the platform and onshore LNG plant) during operations. The trunkline is designed and was installed for maintenance-free operation for at least a 30-year period.

Maintenance and minor repairs (and any associated testing) may include, but are not limited to:

- Equipment change-outs—The subsea system (upstream of the platform) includes some modular and retrievable items. Upon confirmation of degradation or failure, retrievable units may be recovered and replaced with a new module, typically performed with the aid of an ROV or remotely operated tool. Change-out is planned for very few retrievable items, however for the purposes of risk assessment under this EP, the frequency has been conservatively estimated as ~2 times per year with declining frequency through steady state operations. Before performing equipment change-outs, the bleeding of equipment such as valves may be required. No equipment change-outs are planned along the trunkline.
- CP system maintenance—Anodes are expected to last for the design life of the pipeline they are protecting. Anode replacement, although not planned, would be undertaken by ROV. If continuity straps are missing or broken, electrical continuity may be restored using an ROV to replace the straps.
- Valve function testing—Function testing is planned for remotely operated valves with critical functions (e.g., emergency shutdown valves). Valve

function testing can be performed from the platform with observations by the ROV, or manually performed by ROV. Routine testing results in small quantities of fluids being discharged.

- Marine growth and calcareous deposit removal—Marine growth and calcareous deposits may be removed by water jetting from an ROV or by divers, generally with potable water or sea water, although items exhibiting calcareous deposit accumulation may require acid washing or soaking (typically using water-soluble sulfamic acid or similar). This task generally precedes pigging or equipment change-out activities, where operation of or access to the equipment is hindered by marine growth or calcareous deposits.
- Stabilisation—Stabilisation may be required to manage spanning and scouring around the subsea system and may involve installing mattresses, grout bags, rocks, frond mats or similar stabilisers, or trenching. Stabilisation of the trunkline is an unplanned and highly improbable activity.
- Excavation for intervention—To undertake subsea IMR, localised excavation may be conducted directly adjacent to the subsea system, allowing access to buried or partly buried infrastructure. Typically, this is conducted by jetting and/or digging equipment from an ROV, vessel, or by using divers, depending on the location, depth, and seabed characteristics. This task generally precedes valve function testing and equipment change-out, however excavation is not expected to be required for every intervention.

Approximate seabed disturbances associated with targeted IMR activities may include:

- placement of grout bags (~1 m^2) concrete mattresses (~18 m^2) or rock for pipeline span correction, protection and stabilisation
- CP anode placement or remediation (~50 m^2)
- placement of ROV tool baskets (~15 m^2) and DP transponders (~2 m^2)
- disturbance from replacement of subsea equipment such as a section of spool, flying lead or jumper – sections up to ~100 m long (i.e. max distance between subsea manifold and tree) within a ~5 m 'touch down' corridor to allow positioning of the spool or jumper.

Estimated discharge compositions and volumes for typical IMR activities include:

- chemical dye releases (~10–20 L) during pressure and leak testing
- control fluid releases (~5–10 L) during hotstab/coldstab interventions and valve function testing
- hydrocarbon (~1–10 m^3), MEG (~100 L) and scale inhibitor (~50 L) during intervention isolations and subsea equipment replacements
- acid-water mix (~20–200 L) during calcium deposit removal
- hydraulic fluid (~20–100 L) from operation of ROVs
- dilute preservation fluids: Corrosion inhibitor, oxygen scavenger, biocide (~5–10 L)
- grout bag filling/hose flush (~20–200 L).

3.4.1.3 Major repairs

This EP has allowed for scenarios where major repairs of the pipeline system (including flowlines, pipelines and umbilicals) may be required.

CAPL has prepared for a potential major repair event by implementing the Emergency Pipeline Repair System (EPRS). The EPRS delivers a set of repair procedures, common repair equipment, and specific equipment for the flowlines and trunkline. The EPRS also includes methodologies for the repair of support infrastructure such as umbilicals and pipelines.

The target repair duration is ~180 days, from mobilisation of equipment and vessels, in situ repair, to recommissioning. Several vessels are likely to be involved to conduct and support the repair works or provide temporary power and controls to maintain system operability and reliability.

As major repair of a pipeline is the most complex major repair activity, this has been described in greater detail below. The EPRS includes a combination of equipment which, when used together, enables a section of production pipeline to be cut out and replaced. It is deployed off the back deck of a support vessel and supported with ROVs. The EPRS is stored in a warehouse in Perth until required. The EPRS equipment includes:

- hydraulic-actuated pipeline lifting and repair equipment deployment frames
- pipe preparation tools, including but not limited to, coating removal, weld seam removal, end preparation, and water blasting equipment
- pipeline specific repair clamps and flange adaptors.

Depending on the seabed conditions at the repair location, additional seabed area immediately surrounding the pipeline system infrastructure may be disturbed if it is determined that pipeline requires de-burial or rock removal prior to repair, or concrete mattresses or rock stabilisation measures post-repair.

The EPRS equipment may be deployed for the flowlines or trunkline where the pipeline (or section of pipeline) does not exceed the limitations of its design (i.e., not within water depths of <20 m).

Pipeline temporary decommissioning

Following a major defect or full bore rupture, the field would be shut-in, and the pipeline allowed to naturally depressurise to subsea ambient pressure, resulting in free-flooding of the pipeline with sea water.

The pipelines would then be flooded with sea water inhibited with chemical additives (including biocide and oxygen scavenger) that will propel a flooding pig towards the defect location. Flooding may be undertaken from both ends of the pipeline, resulting in a release of sea water, gas, condensate, and rich MEG to the marine environment at the location of the defect.

Pipeline repair

The EPRS equipment is operated using ROVs, controlled from the support vessel. Two ROVs are expected to be required. The ROVs are electrically powered from the vessel and deliver hydraulic pressure to the operating parts of the repair system.

Pipeline repair includes the following stages:

- pre-deployment survey

- remove damaged section
- EPRS deployment
- installation of new replacement section
- pipeline stabilisation (if required).

Pre-deployment survey

Prior to deployment of the EPRS, a number of different surveys may be undertaken. These surveys may be undertaken up to 500 m away from the pipeline. The types of survey will depend on the location and event causing the pipeline defect, but may include:

- side scan sonar (SSS) or multibeam echo sounder (MBES) or similar
- ROV
- piezo cone penetration test (PCPT) or similar.

PCPT involves pushing a probe into the seabed to test soil characteristics and strengths. Up to three PCPTs may be required at each of the eight mudmat locations. The tests are expected to comprise a 100 mm diameter cone penetration test to a depth of 5 m.

Removal of damaged sections

If required, the damaged section will undergo pipeline deburial or have rock stabilisation material physically removed. The damaged section of the pipeline will then be cut using appropriate cutting tools.

Once cut, the damaged section of pipeline will be wet stored on the seabed whilst it is cut into smaller sections (~3 m lengths), then loaded into debris removal baskets and transferred back to the vessel.

EPRS deployment

Subsea transponders may be deployed to ensure accurate seabed positioning of the EPRS. The deployment of transponders may result in localised seabed disturbance of approximately 1–2 m^2 (per transponder). Once no longer needed these are recovered back to the vessel using an ROV. The EPRS lifting frames and cradles for repositioning of the pipeline are then deployed and installed.

The length of pipeline over which a typical repair will take place is ~300 m. Over this length, the areas and depths of seabed expected to be disturbed during a repair include:

- at the four pipe lift frame locations, ~450 m^2 of surficial seabed will be disturbed by the pipe lift frame mudmats to an approximate maximum depth of ~4.5 m by the skirt foundations of these mudmats
- at the pipe end repair location, ~250 m^2 of surficial seabed will be disturbed by the repair pipeline flange adaptor (PFA) deployment frame mudmat skirts (up to ~0.3 m depth)
- in the vicinity of the repair location, ~100 m^2 of seabed will be required for temporary wet storage of materials and equipment during the repair operation.

Installation of new replacement section

Once the damaged section of pipeline is removed, the pipeline ends are prepared (coating and weld seams removed) to allow PFA installation. The PFA stud bolts are then tensioned with the flange bolting systems and subsequently back seal tested. The PFAs are then activated to complete the repair.

The entire pipeline is then typically subjected to a hydrostatic leak testing. If the leak testing fails, the repair will need to be rectified, and re-installed. The leak test may comprise flooding, gauging, and/or cleaning pigs, but is typically performed using a small water-winning/filtration and chemical injection spread, and high pressure pumping equipment, and will use an onshore spread that will differ depending on the pipeline.

Pipeline stabilisation

Depending on the seabed conditions at the repair location, additional seabed area may be disturbed by permanent concrete mattresses and post-repair rock stabilisation measures. However, this is location specific and thus will need to be determined at the time of event.

Pipeline recommissioning

Following a successful hydrostatic leak test, the pipeline must be recommissioned via a dewatering and conditioning pig train. The conditioning pig train is expected to comprise slugs of compressed air, treated potable water, and MEG.

The pipeline contents will be discharged subsea via the platform.

3.4.2 Onshore

3.4.2.1 Inspections

Most of the onshore section of the trunkline is buried until it emerges above ground, upstream of the onshore endpoint. Internal inspection of the trunkline in the microtunnel and onshore section is typically via IP.

Visual inspection of the onshore section is limited as the pipeline is mostly buried, although bell holes (excavations) can allow inspection of a pipe section. General visual inspection of the exposed section of trunkline and the surrounding PL99 pipeline licence area is conducted in accordance with the *Wheatstone Upstream Trunkline System Inspection and Monitoring Plan* (Ref. 23).

3.4.2.2 Maintenance and repair

Maintenance of the onshore trunkline section can include CP system maintenance, coating repair, maintenance pigging (from the platform), as well as maintenance of access ways, pig receiver station, valves and associated auxiliaries, and instrumentation. The maintenance activities for the pig traps typically include the greasing of hinges, UT for detection of internal corrosion, and maintenance of the pig signaller.

For repair of the buried onshore sections, the trunkline will typically be accessed from the side, requiring localised excavation work to remove backfilled soil in which the pipeline is housed. Surface treatment and work on the outer surface of the onshore section may be required in exceptional circumstances. If the pipeline is damaged and requires repair, temporary clamps may be installed on damaged sections, and onshore pipe section removal and replacement may be conducted in the event of failure, which will require heavy machinery to access the site.

Onshore IMR activities may require the use of vehicles for transporting personnel, tools, equipment, and waste. Excavators, cranes, vehicles, and other equipment may be used if clamping is required. Portable lighting and diesel generators may be needed for short durations if night activities are required.

3.5 Decommissioning

Under Section 270(3)(c) of the OPGGS Act, before a title can be surrendered, all property brought into a title area must be removed or arrangements that are satisfactory to NOPSEMA must be made in relation to the property.
Section 572(3) of the OPGGS Act also requires a titleholder to remove all property that is within the title area and is neither used nor to be used in connection with the operations authorised by the title.

3.5.1 End of facility life

As described in Section 3.1.1 the operational design life for the Wheatstone and Iago field development is expected to be ~30 years. Therefore, no end of facility life (EOFL) decommissioning activities for the subsea infrastructure is scheduled to occur within the 5-year in-force period of this EP.

Prior to any EOFL decommissioning CAPL will submit a Decommissioning EP to NOPSEMA that will demonstrate that the impacts and risks associated with field decommissioning activities are reduced to ALARP and acceptable levels. While the requirement for complete removal of property will be considered the base case within any Decommissioning EP (as per the requirements of Section 572(3) of the OPGGS Act), alternative arrangements that may be satisfactory are ones that deliver equal or better environmental, safety and well integrity outcomes compared to complete removal (Ref. 24). The Decommissioning EP will be developed to meet the requirements of the OPGGS Act and OPGGS(E)R, as well as any additional relevant legislation (e.g., *Environment Protection (Sea Dumping) Act 198*1) or guidelines (e.g., Ref. 21; Ref. 24) in force at the time.

3.5.2 Subsea inventory

To assist with the long-term planning for decommissioning an internal inventory of subsea property is maintained by CAPL.

A static summary of the inventory has been included in appendix c.

3.5.3 Removal of property

In accordance with Section 572(3) of the OPGGS Act, removal of property will be undertaken throughout operations when property is neither used, nor to be used, in connection with the operations. However, NOPSEMA recognises that removal may not always be practical at the time when property is neither used, nor to be used (Ref. 21).

The process that CAPL will follow to determine where a deviation from the requirement to remove property at the point in time that it is neither used nor to be used is appropriate, includes consideration of several criteria. Deferral of removal may be considered by CAPL if:

- redundant equipment is incorporated within or located close to live infrastructure which introduces additional complexities and risks that can be avoided during EOFL decommissioning
- while subsea property is in situ, the risks to other marine users associated with its physical presence are low

- the environmental risks when leaving redundant infrastructure in-situ under current operations is considered to be low
- the cost of standalone retrieval work scopes are considered disproportionate when considering the risks of retrieval during current operations versus risk of extending duration in-situ.

If after applying the above criteria, any redundant property is to remain in-situ within the title area for decommissioning as part of EOFL, it will be recorded in the subsea inventory (refer to Section 3.5.2), and will be subject to inspections to ensure that the property does not degrade to a state that would prevent future removal (refer to Section 3.4).

3.6 Field support

3.6.1 Vessel operations

Platform supply vessels will transfer miscellaneous items including chemicals and diesel to the platform via the platform cranes, and will also bunker (via a platform hose to the respective platform storage tanks) water, MEG, TEG, and diesel. A safety standby vessel, capable of launching a fast rescue craft to recover personnel from the sea, may be present to support the platform. For occasional major maintenance campaigns or platform TAR, an accommodation support vessel (ASV) may be required for short periods.

Typically, a survey-type vessel (or similar) will be used for IMR. In exceptional circumstances, depending on the type of IMR activity, additional similar vessels may be used, and/or a larger vessel. IMR vessels may be supported by helicopter operations for crew changes if required (Section 3.6.2).

Vessels will typically use dynamic positioning (DP), however in certain circumstances, anchoring or use of pre-laid moorings may be required. Vessels will not use Heavy Fuel Oil (HFO) but will utilise a lighter marine fuel such as marine diesel oil (MDO) or Marine Gas Oil (MGO). Vessels are expected to return to port to bunker, although may occasionally bunker at sea. Vessels routinely discharge a variety of wastewater streams to the marine environment including sewage, greywater, food waste, CW, brine, and oily bilge water; vessels may also incinerate solid wastes.

3.6.2 Helicopter operations

The platform is serviced by helicopters, generally from Barrow Island, which are used for passenger transfers/crew changes and delivering minor supplies. Where required, helicopters may also be used for crew transfers to/from the IMR vessels. When an ASV is on site, the vessel helideck may also be utilised.

4 description of the environment

4.1 Overview

For the purposes of this EP, CAPL have defined and described the following three areas:

- OA—as described in Section 3.1.1, this is the area in which the petroleum activities will be undertaken; for the purposes of describing the environment this has further been split into the offshore fields (including platform) and the trunkline
- Environment that May Be Affected (EMBA)—defined as the area in which CAPL's activities may result in environmental impacts (thus for the purpose of this EP, defined as the area potentially impacted by hydrocarbons from a spill event above impact concentration thresholds [Table 7-5])
- Environmental Exposure Area (EEA)—defined as the outer area in which hydrocarbons from a spill event may be present in the environment (thus for the purpose of this EP, defined as the area potentially exposed to hydrocarbons from a spill event above exposure concentration thresholds [Table 7-4]).

These areas are shown in Figure 4-1.

CAPL's *Description of the Environment: CAPL Planning Area* (Ref. 1; appendix d) describes the environment within the total area in which all CAPL's activities may interact with the environment. The above three areas, the OA, EMBA and EEA, that are specifically relevant to activities within this EP, all occur within the spatial extent of Planning Area (PA). Therefore, the description of the environment as provided for the PA (Ref. 1; appendix d) is appropriate for use in this EP.

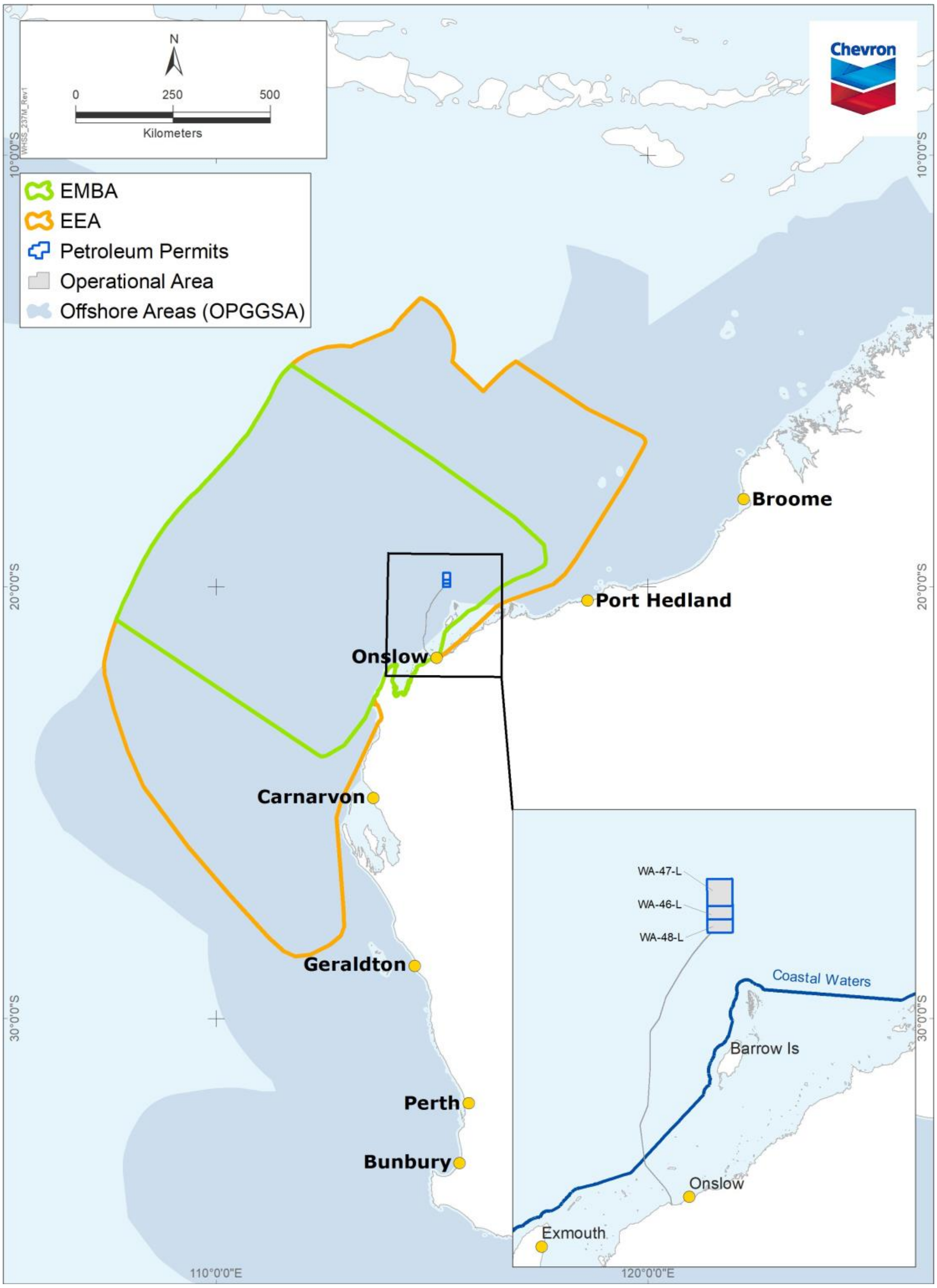


Figure 4-1: OA, EMBA, and EEA for Wheatstone start-up and operations

4.2 Physical environment

CAPL's *Description of the Environment* (Ref. 1; appendix d) identifies and summarises the physical environment within the PA.

4.3 Biological environment

CAPL's *Description of the Environment* (Ref. 1; appendix d) identifies and summarises the biological environment within the PA. Key threats and relevant management actions from any Conservation Advices or Recovery Plans for threatened or migratory species have also been described (Ref. 1; appendix d).

The specific presence of biological values and sensitivities within the OA, EMBA and EEA is detailed in the following subsections.

4.3.1 Marine mammals

Based on searches of the protected matters database (Ref. 25;appendix e), the threatened and/or migratory mammal species shown in Table 4-1 may be present within the OA, EMBA and EEA. Biologically important areas (BIAs) associated with marine mammal species are listed in Table 4-2.

Table 4-1: Presence of threatened and/or migratory marine mammals

Common name	OA (field)	OA (trunkline)	EMBA	EEA
Cetaceans (whales)				
Antarctic Minke Whale, Dark-shoulder Minke Whale			✓	✓
Blue Whale	✓	✓	✓	✓
Bryde’s Whale	✓	✓	✓	✓
Fin Whale	✓	✓	✓	✓
Humpback Whale	✓	✓	✓	✓
Sei Whale	✓	✓	✓	✓
Southern Right Whale		✓	✓	✓
Sperm Whale	✓	✓	✓	✓
Cetaceans (dolphins)				
Indo–Pacific Humpback Dolphin		✓	✓	✓
Killer Whale, Orca	✓	✓	✓	✓
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations)	✓	✓	✓	✓
Sirenians				
Dugong		✓	✓	✓

Table 4-2: Presence of BIAs for marine mammals

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
Dugong	Breeding	Year-round			✓	✓
	Calving	Year-round			✓	✓
	Foraging (high density seagrass beds)	Year-round			✓	✓
	Nursing	Year-round			✓	✓
Humpback Whale	Migration (north and south)	Northern migration, late July to September		✓	✓	✓
	Resting	Winter			✓	✓
Pygmy Blue Whale	Distribution	(Not defined in database)	✓	✓	✓	✓

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
	Foraging	(Not defined in database)			✓	✓
	Migration	Northern migration (enter Perth canyon January to May; pass Exmouth April to August; continue north to Indonesia). Southern migration (follow WA coastline from October to late December)	✓		✓	✓

4.3.2 Reptiles

Based on searches of the protected matters database (Ref. 25;appendix e), the threatened and/or migratory reptile species shown in Table 4-3 may be present within the OA, EMBA and EEA. Habitat critical to survival and BIAs associated with marine reptile species are listed in Table 4-4 and Table 4-5 respectively.

Table 4-3: Presence of threatened and/or migratory reptiles

Common name	OA (field)	OA (trunkline)	EMBA	EEA
Seasnakes				
Leaf-scaled Seasnake		✓	✓	✓
Short-nosed Seasnake		✓	✓	✓
Turtles				
Flatback Turtle	✓	✓	✓	✓
Green Turtle	✓	✓	✓	✓
Hawksbill Turtle	✓	✓	✓	✓
Leatherback Turtle, Leathery Turtle, Luth	✓	✓	✓	✓
Loggerhead Turtle	✓	✓	✓	✓

Table 4-4: Critical habitat for the survival of marine turtles

Common name	Location	Seasonal presence	Occurrence descriptor
Loggerhead Turtle	Exmouth Gulf and Ningaloo Coast. 20 km internesting buffer	Nov–May	Known to occur
	Gnaraloo Bay and beaches. 20 km internesting buffer	Nov–May	Known to occur
	Shark Bay, all coastal and island beaches out to the northern tip of Dirk Hartog Island. 20 km internesting buffer	Nov–May	Known to occur
Green Turtle	Dampier Archipelago. 20 km internesting buffer	Nov–Mar	Known to occur
	Barrow Island, Montebello Islands, Serrurier Island, and Thevenard Island. 20 km internesting buffer	Nov–Mar	Known to occur
	Exmouth Gulf and Ningaloo Coast. 20 km internesting buffer	Nov–Mar	Known to occur

Common name	Location	Seasonal presence	Occurrence descriptor
Hawksbill Turtle	Dampier Archipelago, including Delambre Island and Rosemary Island. 20 km internesting buffer	Oct–Feb	Known to occur
	Cape Preston to mouth of Exmouth Gulf including Montebello Islands and Lowendal Islands. 20 km internesting buffer	Oct–Feb	Known to occur
Flatback Turtle	Cemetery Beach, Port Hedland. 60 km internesting buffer	Oct–Mar	Known to occur
	Mundabullangana Beach. 60 km internesting buffer	Oct–Mar	Known to occur
	Dampier Archipelago, including Delambre Island and Hauy Island. 60 km internesting buffer	Oct–Mar	Known to occur
	Barrow Island, Montebello Islands, coastal islands from Cape Preston to Locker Island. 60 km internesting buffer	Oct–Mar	Known to occur

Table 4-5: Presence of BIAs for reptiles

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
Flatback Turtle	Aggregation				✓	✓
	Foraging	Summer			✓	✓
	Internesting				✓	✓
	Internesting buffer	Summer	✓	✓	✓	✓
	Mating	Summer			✓	✓
	Nesting	Summer		✓	✓	✓
Green Turtle	Aggregation				✓	✓
	Basking	Summer			✓	✓
	Foraging	Summer			✓	✓
	Internesting	Summer			✓	✓
	Internesting buffer	Summer			✓	✓
	Mating	Summer			✓	✓
	Nesting	Summer			✓	✓
Hawksbill Turtle	Foraging	Year-round, spring, early-summer			✓	✓
	Internesting	Spring, early-summer			✓	✓
	Internesting buffer	Year-round, spring, early-summer		✓	✓	✓
	Mating	Year-round, spring, early-summer			✓	✓
	Nesting	Year-round, spring, early-summer			✓	✓

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
Loggerhead Turtle	Internesting buffer				✓	✓
	Nesting				✓	✓

4.3.3 Fishes, including sharks and rays

Based on searches of the protected matters database (Ref. 25;appendix e), the threatened and/or migratory fish species shown in Table 4-6 may be present within the OA, EMBA and EEA. BIAs associated with fish species are listed in Table 4-7.

Table 4-6: Presence of threatened and/or migratory fishes, including sharks and rays

Common name	OA (field)	OA (trunkline)	EMBA	EEA
Dwarf Sawfish, Queensland Sawfish	✓	✓	✓	✓
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray	✓	✓	✓	✓
Green Sawfish, Dindagubba, Narrowsnout Sawfish	✓	✓	✓	✓
Grey Nurse Shark (west coast population)	✓	✓	✓	✓
Longfin Mako	✓	✓	✓	✓
Narrow Sawfish, Knifetooth Sawfish	✓	✓	✓	✓
Oceanic Whitetip Shark	✓	✓	✓	✓
Porbeagle, Mackerel Shark			✓	✓
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred’s Ray, Resident Manta Ray	✓	✓	✓	✓
Shortfin Mako, Mako Shark	✓	✓	✓	✓
Whale Shark	✓	✓	✓	✓
White Shark, Great White Shark	✓	✓	✓	✓

Table 4-7: Presence of BIAs for fishes, including sharks and rays

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
Whale Shark	Foraging	Spring	✓	✓	✓	✓
	Foraging (high density prey)	Apr-Jun. Autumn			✓	✓

4.3.4 Seabirds and shorebirds

Based on searches of the protected matters database (Ref. 25;appendix e), the threatened and/or migratory seabird and shorebird species shown in Table 4-8 may be present within the OA, EMBA and EEA. BIAs associated with fish species are listed in Table 4-9.

Table 4-8: Presence of threatened and/or migratory seabirds and shorebirds

Common name	OA (field)	OA (trunkline)	EMBA	EEA
Abbott's Booby			✓	✓
Amsterdam Albatross				✓
Asian Dowitcher		✓	✓	✓
Australian Fairy Tern	✓	✓	✓	✓
Australian Lesser Noddy				✓
Australian Painted Snipe		✓	✓	✓
Bar-tailed Godwit		✓	✓	✓
Black-browed Albatross				✓
Bridled Tern			✓	✓
Campbell Albatross, Campbell Black-browed Albatross			✓	✓
Caspian Tern			✓	✓
Common Greenshank, Greenshank		✓	✓	✓
Common Noddy	✓	✓	✓	✓
Common Sandpiper	✓	✓	✓	✓
Curlew Sandpiper	✓	✓	✓	✓
Eastern Curlew, Far Eastern Curlew	✓	✓	✓	✓
Flesh-footed Shearwater, Fleshy-footed Shearwater			✓	✓
Fork-tailed Swift		✓	✓	✓
Great Frigatebird, Greater Frigatebird	✓		✓	✓
Greater Crested Tern			✓	✓
Greater Sand Plover, Large Sand Plover			✓	✓
Grey Falcon		✓	✓	
Indian Yellow-nosed Albatross				✓
Lesser Frigatebird, Least Frigatebird	✓	✓	✓	✓
Little Tern				✓
Night Parrot		✓	✓	✓
Northern Giant Petrel				✓
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri)		✓	✓	✓
Oriental Plover, Oriental Dotterel		✓	✓	✓
Oriental Pratincole		✓	✓	✓
Osprey	✓	✓	✓	✓
Pectoral Sandpiper	✓	✓	✓	✓
Red Knot, Knot	✓	✓	✓	✓
Red-tailed Tropicbird				✓
Roseate Tern			✓	✓
Sharp-tailed Sandpiper	✓	✓	✓	✓

Common name	OA (field)	OA (trunkline)	EMBA	EEA
Shy Albatross, Tasmanian Shy Albatross				✓
Soft-plumaged Petrel			✓	✓
Southern Giant-Petrel, Southern Giant Petrel		✓	✓	✓
Southern Royal Albatross				✓
Streaked Shearwater	✓	✓	✓	✓
Wandering Albatross				✓
Wedge-tailed Shearwater			✓	✓
White-capped Albatross				✓
White-tailed Tropicbird				✓
White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren			✓	✓

Table 4-9: Presence of BIAs for seabirds and shorebirds

Common name	BIA behaviour	Seasonal presence	OA (field)	OA (trunkline)	EMBA	EEA
Bridled Tern	Foraging (in high numbers)	Late-September to early-May				✓
Fairy Tern	Breeding	July to late-September			✓	✓
Lesser Crested Tern	Breeding	March to June		✓	✓	✓
Lesser Frigatebird	Breeding	March to September				✓
Little Shearwater	Foraging (in high numbers)	Early-January to early-December; mainly April to November				✓
Little Tern	Resting	June, July and October				✓
Roseate Tern	Breeding	Mid-March to July			✓	✓
Sooty Tern	Foraging	Late-August to early-May				✓
Wedge-tailed Shearwater	Breeding	Mid-August to April (Pilbara) or mid-May (Shark Bay)	✓	✓	✓	✓
	Foraging (in high numbers)	Mid-August to May				✓
White-faced Storm Petrel	Foraging (in high numbers)					✓
White-tailed Tropicbird	Breeding	May and October				✓

4.3.5 Marine habitats

Subtidal habitat includes coral reef, seagrass, filter feeder (e.g., sessile invertebrates), and macroalgae communities. Figure 4-2 to Figure 4-10 are a series of marine habitat maps covering both the OA and broader EMBA and EEA; spanning an area east of Dampier, seaward to the Wheatstone Platform and south to the Ningaloo Marine Park.

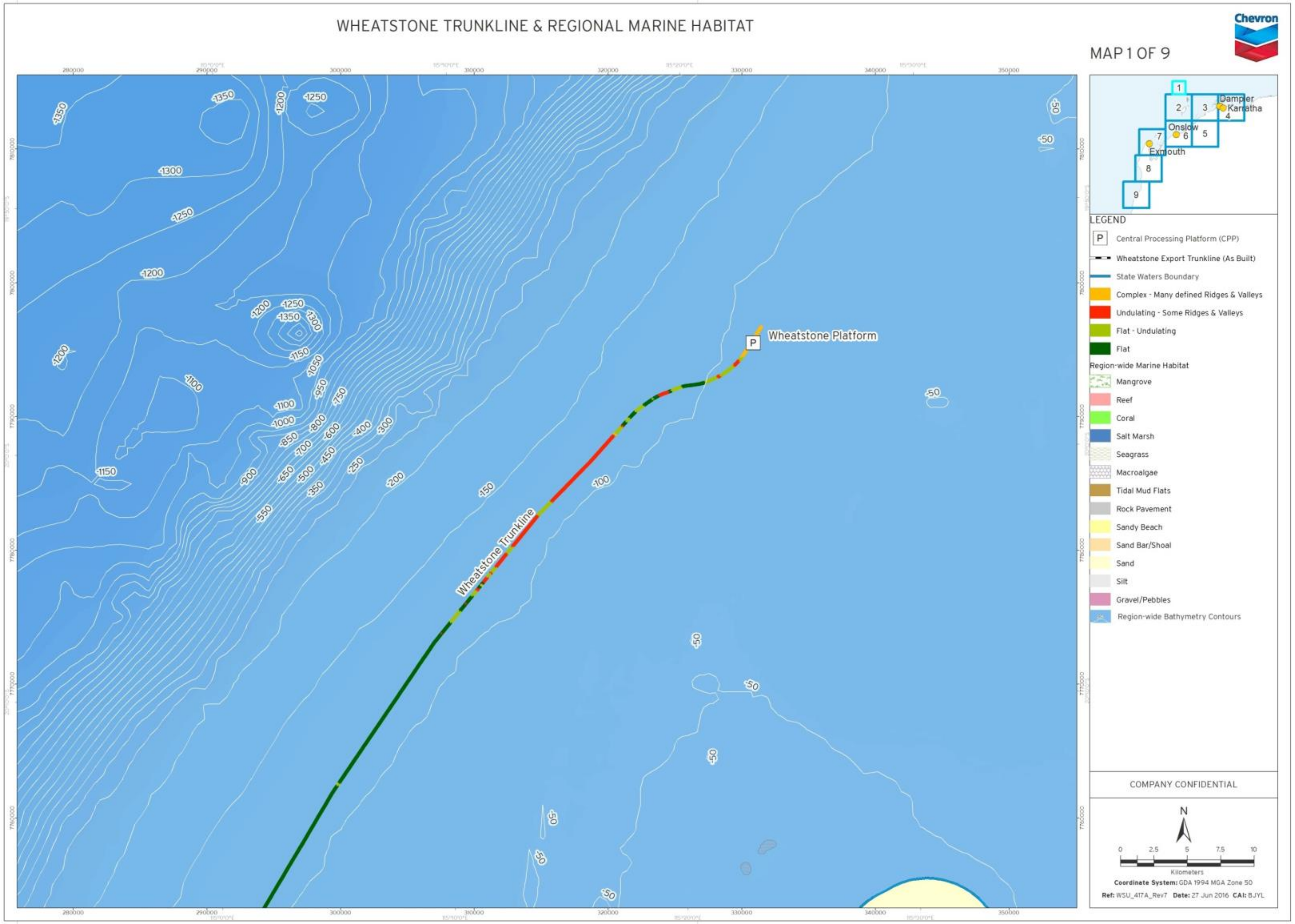


Figure 4-2: Wheatstone trunkline and regional marine habitat (map 1 of 9)

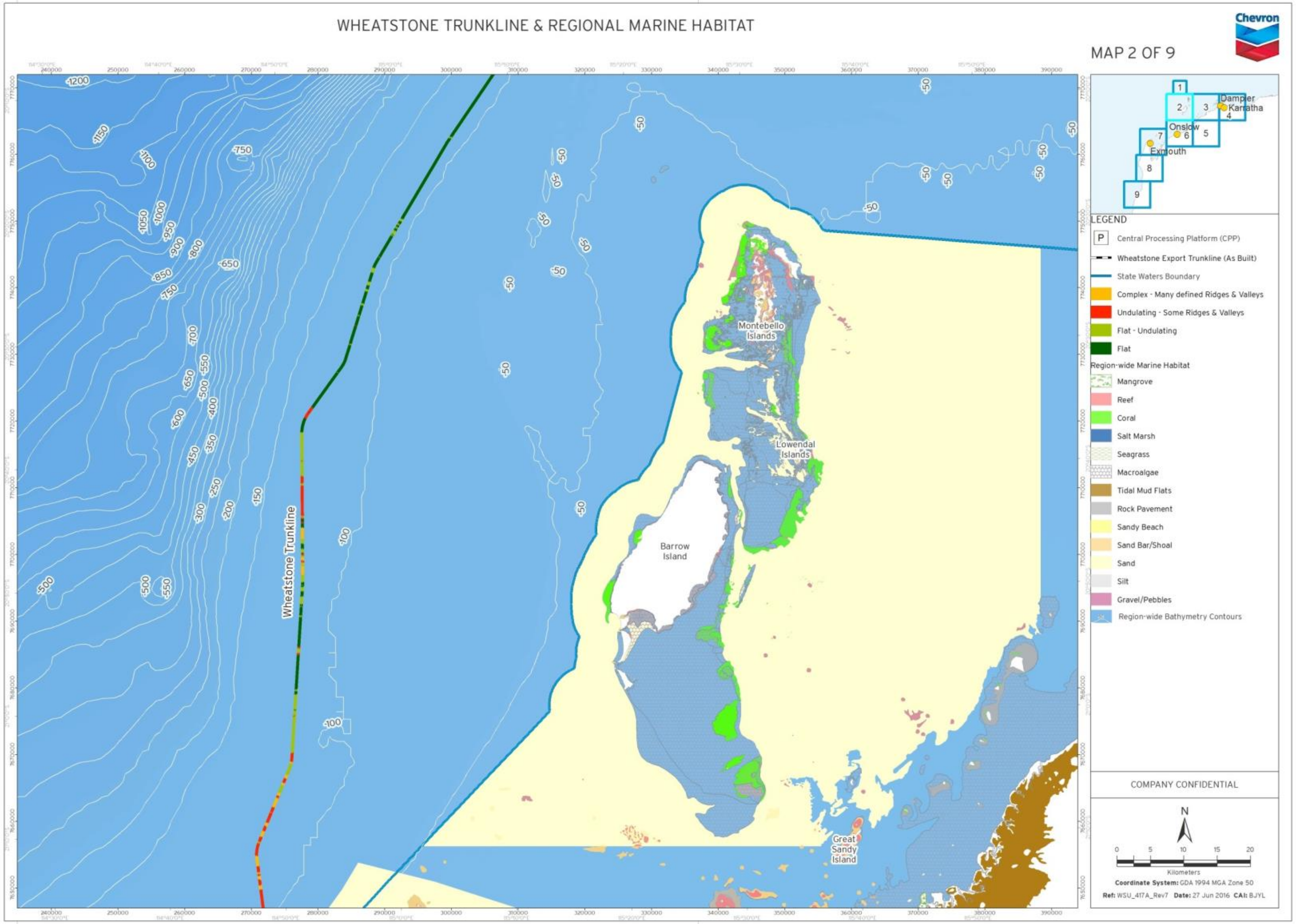


Figure 4-3: Wheatstone trunkline and regional marine habitat (map 2 of 9)

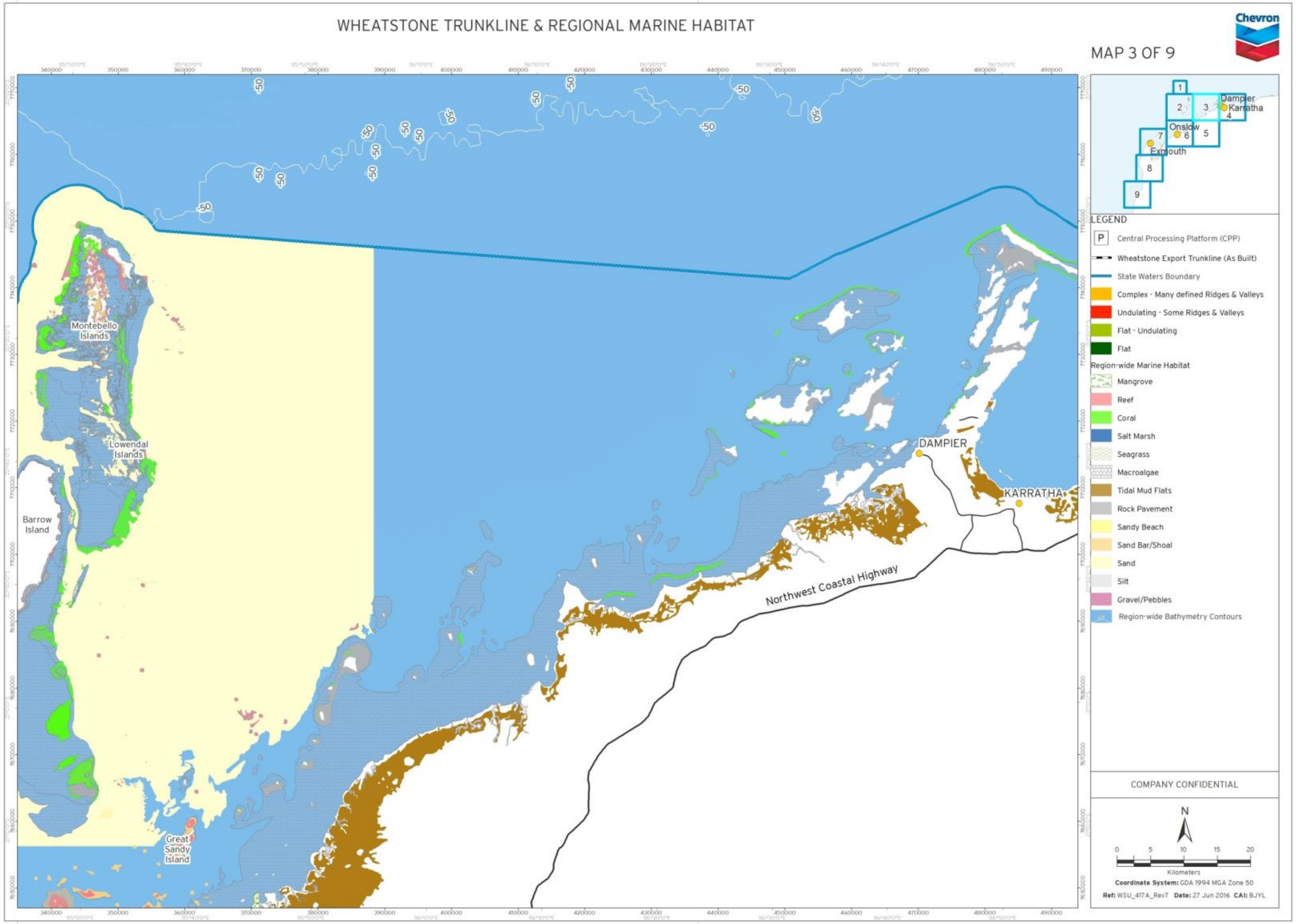


Figure 4-4: Wheatstone trunkline and regional marine habitat (map 3 of 9)

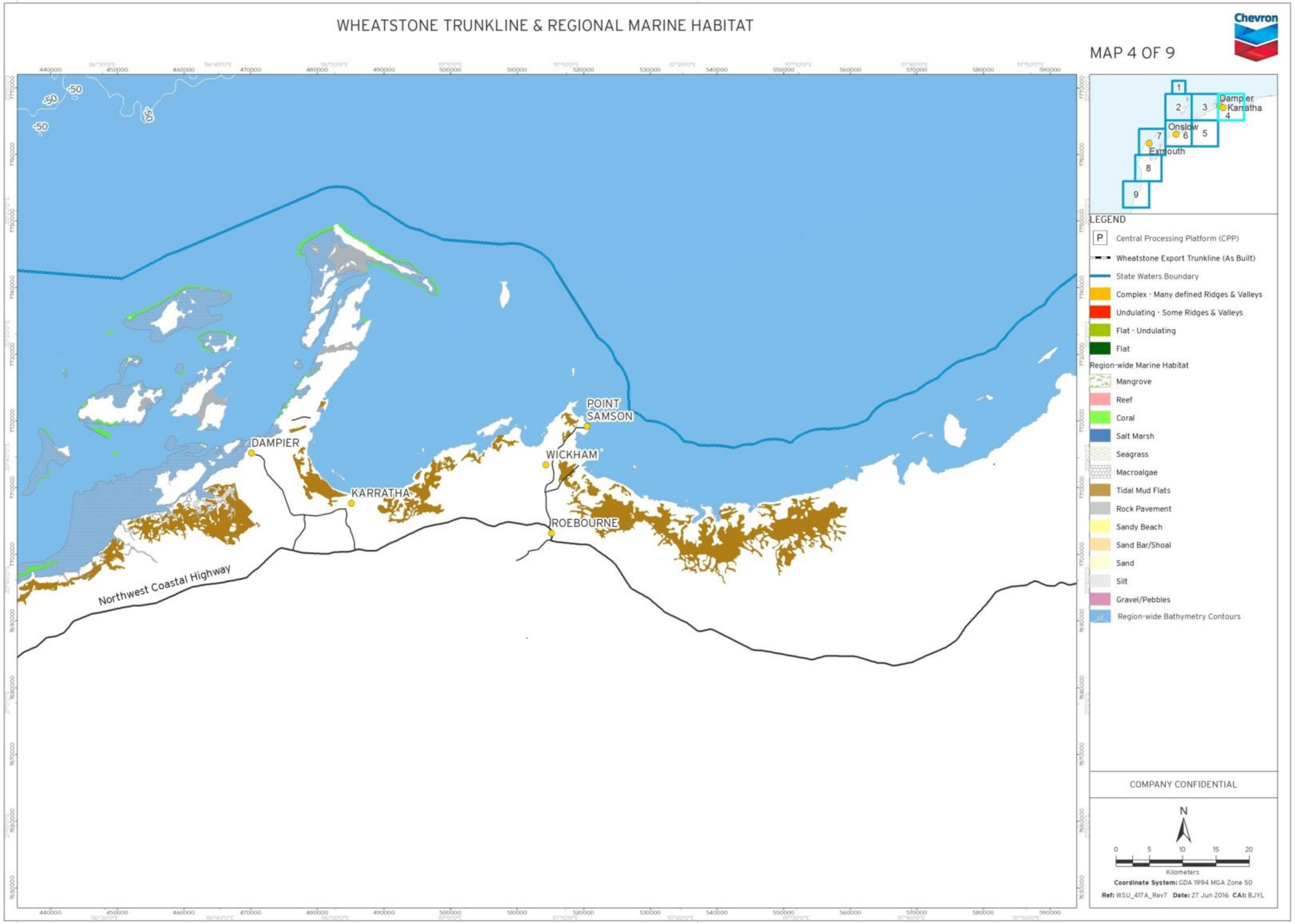


Figure 4-5: Wheatstone trunkline and regional marine habitat (map 4 of 9)

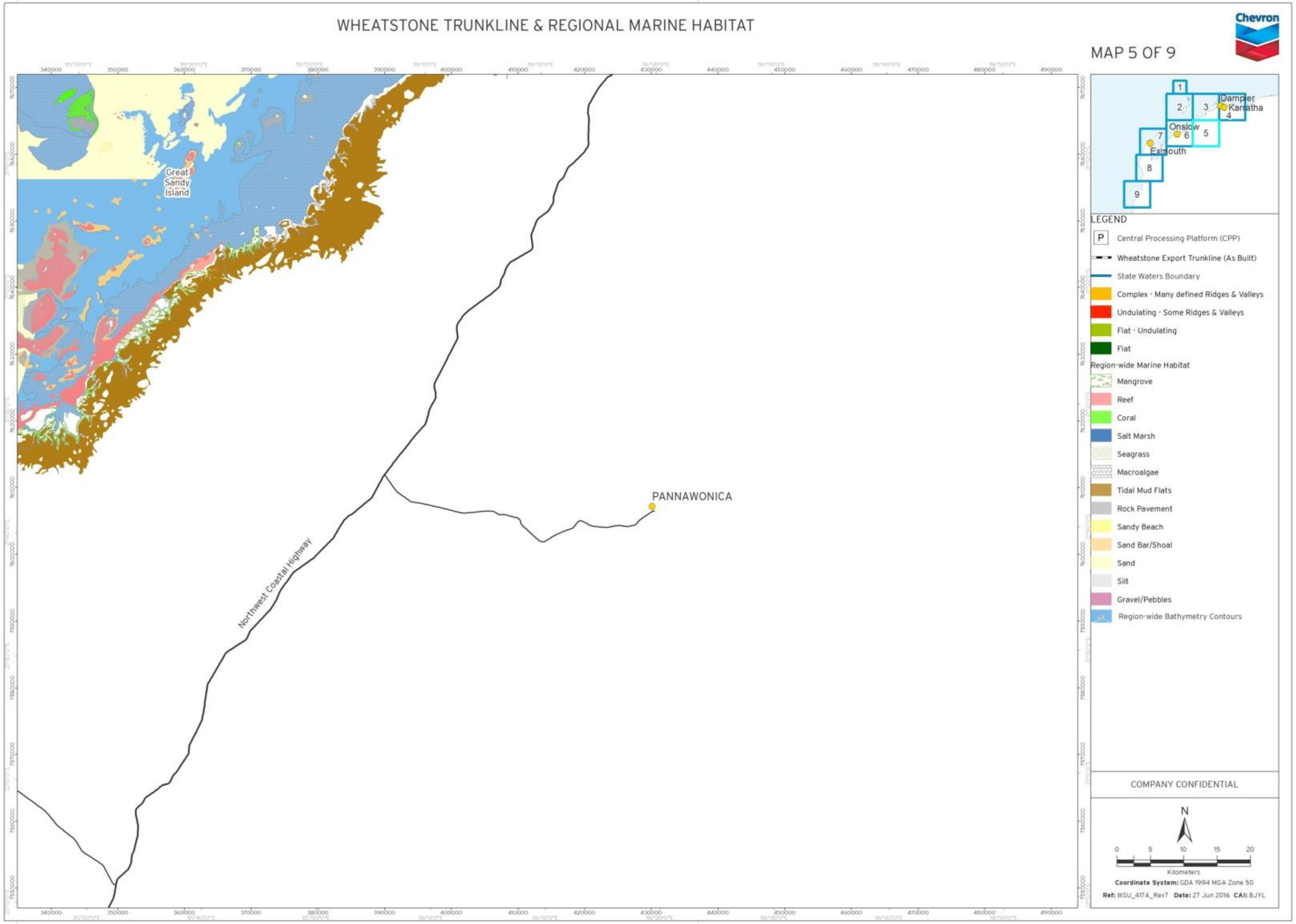


Figure 4-6: Wheatstone trunkline and regional marine habitat (map 5 of 9)

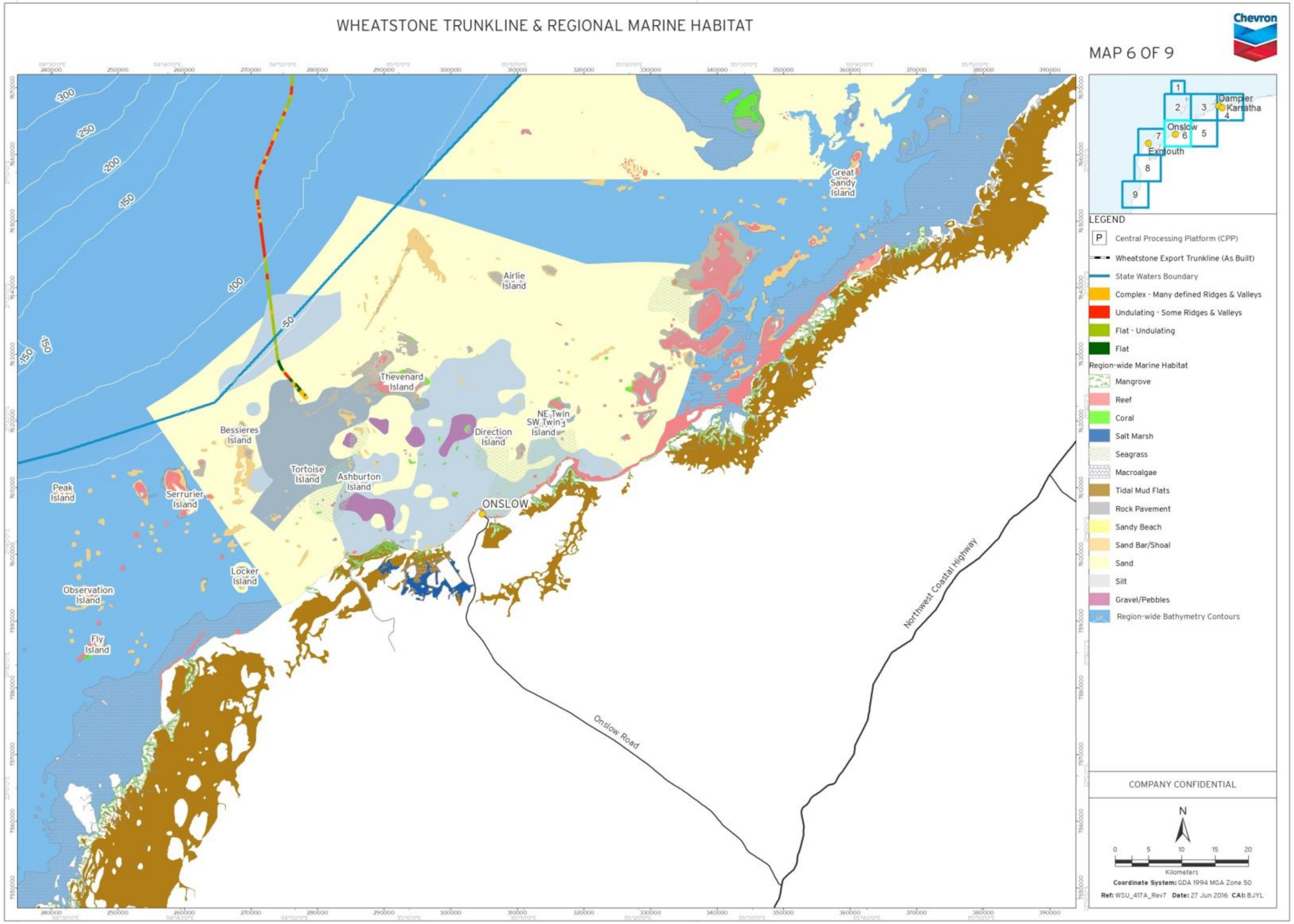


Figure 4-7: Wheatstone trunkline and regional marine habitat (map 6 of 9)

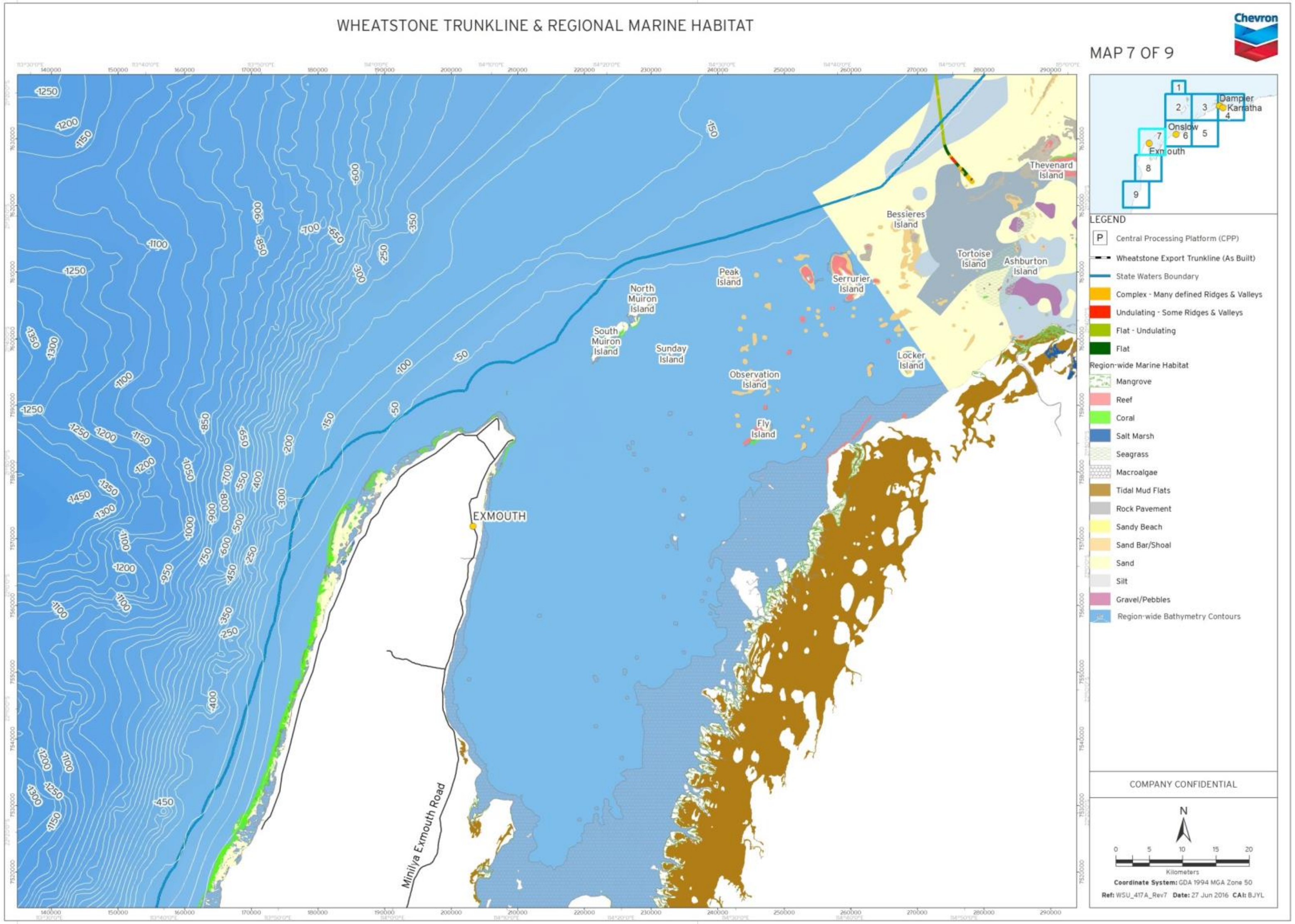


Figure 4-8: Wheatstone trunkline and regional marine habitat (map 7 of 9)

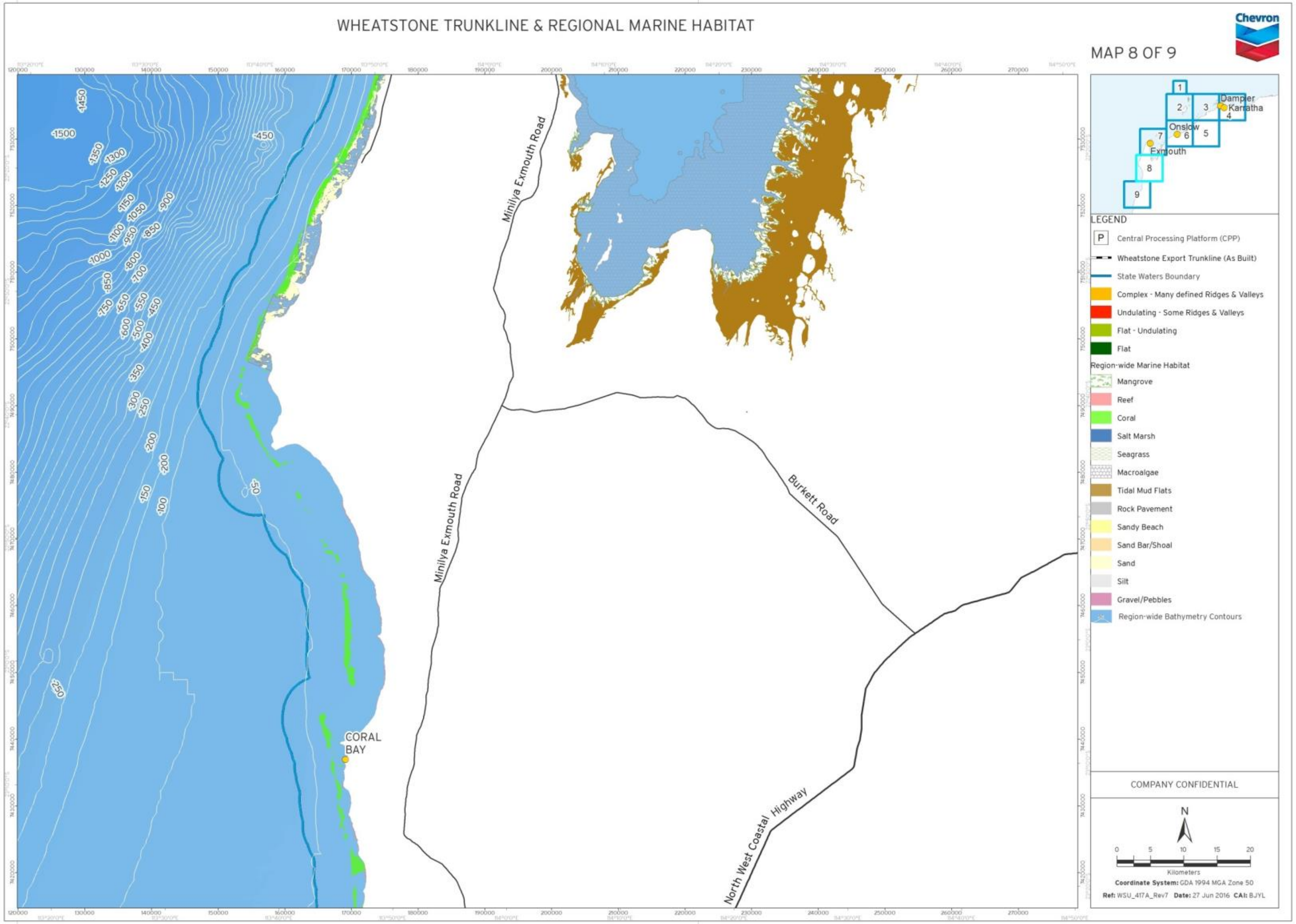


Figure 4-9: Wheatstone trunkline and regional marine habitat (map 8 of 9)

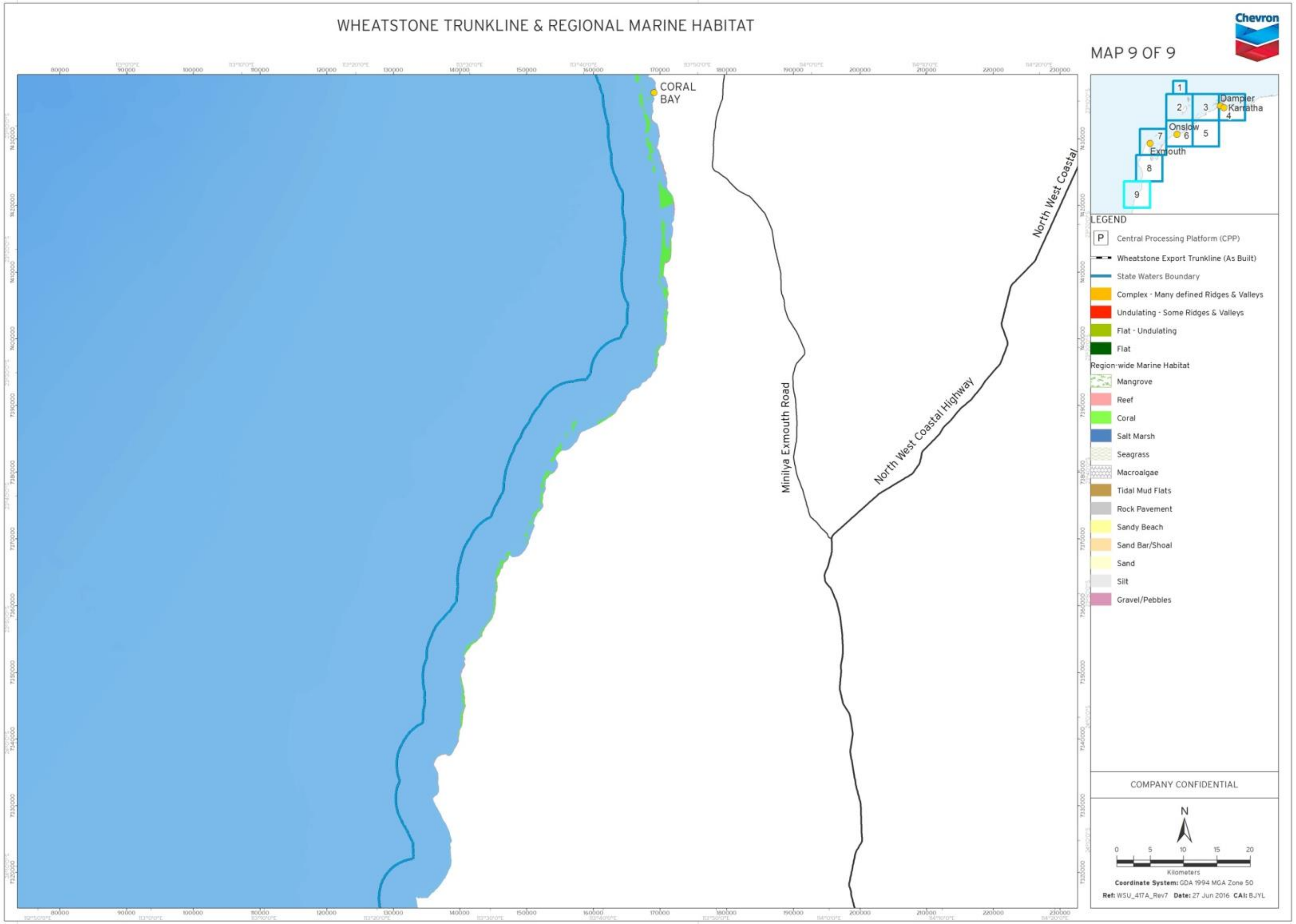


Figure 4-10: Wheatstone trunkline and regional marine habitat (map 9 of 9)

4.3.5.1 Operational area (trunkline)

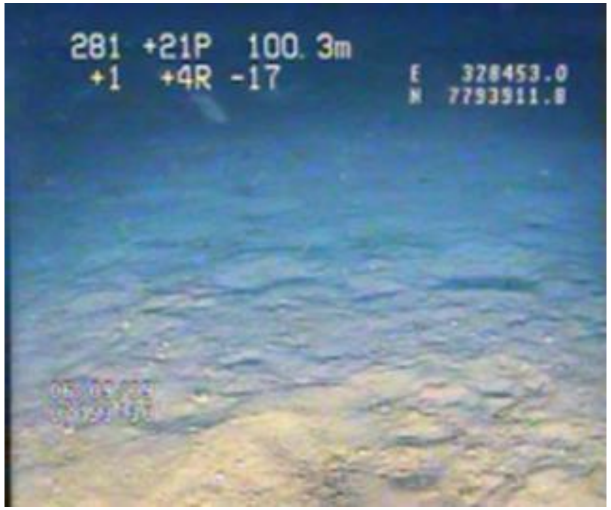
Several data sources were used to define benthic habitat types along the trunkline, including targeted ROV benthic surveys, and geotechnical surveys associated with infrastructure installation for the Wheatstone Project. From the data collected, four benthic habitats were defined in terms of the sea floor substrate (soft versus hard substrate) and topographical complexity, and were used to classify habitat type adjacent to the trunkline. These habitat types were: complex (ridges and valleys), undulating (some ridges), flat (undulating) and flat. The former two are dominated by hard substrate and the latter two by unconsolidated sediment. The description of the trunkline habitat (below) starts at the Wheatstone Platform and continues landward. Table 4-10 describes these habitats and their ecological values; their placement along the Trunkline is shown in Figure 4-11.

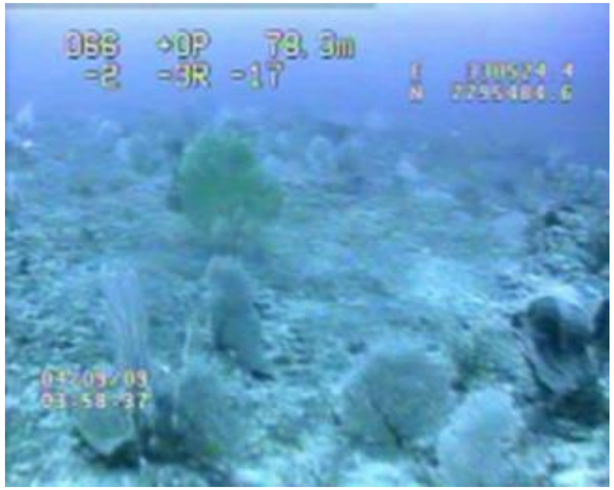
Habitats along the trunkline at depths >100 m were characterised primarily by undulating, flat (undulating), or flat substrates (Figure 4-2, Figure 4-3), with only small localised areas of complex habitat (Ref. 26).

In waters depths between 15 m and 100 m (Figure 4-7), the dominant habitat (>75% of the substratum) observed along the trunkline was sand (Ref. 26). Other habitats included low-profile reef and sand-inundated reefs. Biotic communities associated with the sand habitat in depths between 15 m and 100 m were dominated by mats of red algae, while invertebrates (e.g., sponges, macroalgae) were evident on more complex habitat types (Ref. 26).

The sub-tidal habitats <15 m (adjacent to the mainland, largely in State waters) were described extensively in the Wheatstone Draft EIS/ERMP (Ref. 26). The trunkline in these shallow water environments intercepted inter-reefal habitats characterised by sponges, macroalgae, seagrasses, and sand largely devoid of invertebrates and flora. These form mosaics of habitat patches of varying spatial scales. The broad-scale distribution of seagrasses is shown in Figure 4-7 and the other habitats are shown on maps in Chapter 6 of the Draft EIS/ERMP (Ref. 26). Abundance estimates of these organisms not only vary spatially, but for macroalgae and seagrasses cover estimates vary seasonally. The closest coral reef structure to the trunkline is Ashburton Island, about 1 km west of the trunkline (Figure 4-7). Cover of scleractinian corals on this and other reefs adjacent to the trunkline was typically <10% at the time of the surveys. Turf algae was the dominant sessile benthic organism on these reefs.

Table 4-10: Trunkline habitat characterisation

Habitat	Description	% of Trunkline and position	Representative Imagery
Flat	Habitats characterised by unconsolidated soft sediment, and little to no hard substrate. Flat habitats support no pronounced benthic assemblages, but may support some burrowing organisms.	43%. Largely in deeper habitats >100 m depth, and away from topographic features of ridgelines.	
Flat – Undulating	Habitats largely characterised by unconsolidated soft sediment, with small patches of topographic complexity representing rock or hard structure in undulating areas, which has a low potential to support invertebrate assemblages. Flat-undulating habitats may support 1 to 2% of benthic invertebrates, such as sponges, but has no pronounced benthic assemblages; may support some burrowing organisms.	28%. Largely in deeper habitats >100 m depth, and away from topographic features of ridgelines.	

Habitat	Description	% of Trunkline and position	Representative Imagery
Undulating – Some Ridges and Valleys	Habitats largely characterised by hard substrate patches broken by areas of soft unconsolidated sediment that appear to have accumulated between undulations. Undulating habitat may support 2 to 10% of benthic invertebrates, such as sponges and the presence of gorgonians; may support some burrowing organisms in areas of soft substrate.	22%. Largely adjacent to state water (>70 m depth), and adjacent to the Wheatstone Platform, on the ridgeline.	
Complex – Many Defined Ridges and Valleys	Habitats largely characterised by hard substrate forming calcariate reef. Undulating habitat may support 2 to 10% or more of benthic invertebrates, such as sponges and gorgonians in more pronounced benthic communities; unlikely to support some burrowing organisms due to the absence of soft substrate.	7%. Largely adjacent to state water (>70 m depth), and adjacent to the Wheatstone Platform, on the ridgeline.	

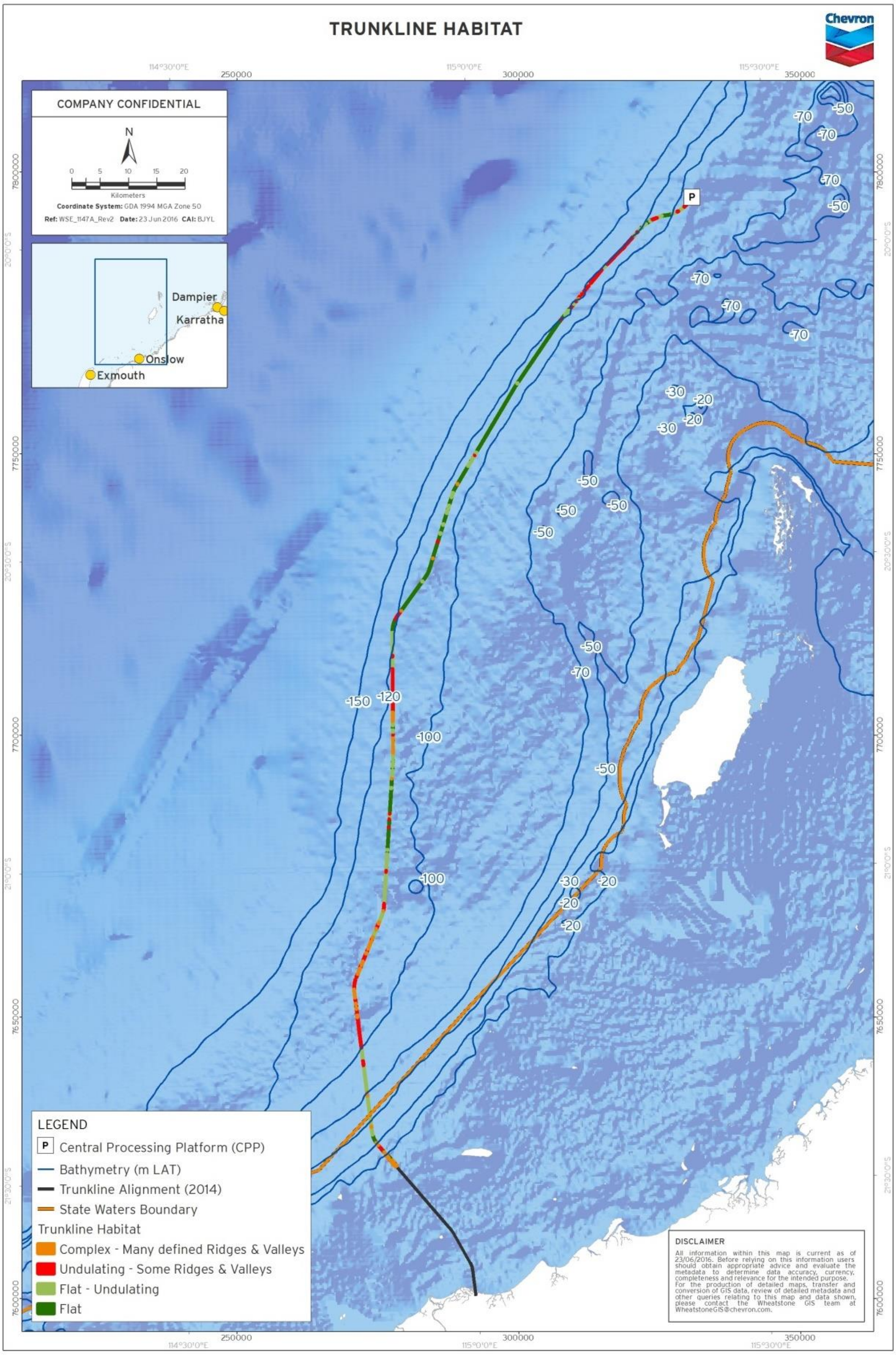


Figure 4-11: Wheatstone trunkline habitat

4.3.5.2 Operational area (platform)

The platform is on a ridgeline (~11 km long), in an area of hard substratum (Figure 4-12, Figure 4-13). The closest drill centre is ~4 km from the ridgeline. Much of the seafloor at the platform and its immediate vicinity comprises hard rock with a thin veneer of sand. This has been identified using a combination of cone penetration tests, multibeam echo sounder and video images taken before the installation of the rock blanket (Ref. 27).

The platform ridgeline is not an isolated area of hard substratum, as there are additional areas of hard substratum to the northeast and southeast, outside the OA. The platform hard substratum may support higher amounts of benthic fauna (such as sponges and soft corals), relative to soft substratum (Ref. 28) (Figure 4-14). Based on studies undertaken for the Project, the categories of marine habitats and associated benthic fauna identified around the platform are described in more detail below.

Benthic or seafloor habitats were characterised by 2–10% cover of sessile benthic invertebrates (Ref. 29). The dominant sessile benthic invertebrates on the ridgeline were soft corals, sea fans, and sponges (Ref. 29) (Figure 4-14). Soft corals and sea fans belong to the order Alcyonacea, but are hereafter collectively referred to as ‘gorgonians’. The term ‘sea fan’ is reserved exclusively for gorgonians with a fan-shaped morphology, which appear to be the dominant growth-form on the ridgeline (Ref. 29) (Figure 4-14). The apparent absence or rarity of zooxanthellae hard corals and gorgonians at the ridgeline probably relate to low benthic light levels at depths >70 m.

A baseline benthic habitat survey was undertaken in December 2016 (Ref. 223). The survey found the dominant benthic organisms on the ridgeline belonged to the phylum Cnidaria, and included gorgonians, antipatharians (or black coral) and hydrozoans. Overall, the cover (percentage cover) and density (counts/unit area) of benthic organisms were low and spatially variable in the study area. Densities were positively correlated with increasing levels of hard substrate and negatively correlated with increasing water depth.

Findings reported in 2010 (Ref. 29) and 2016 (Ref. 223) are similar to those of other surveys conducted on the North West Shelf (NWS), which found hard substratum to be characterised by epifauna assemblages dominated by gorgonians and sponges (Ref. 30).

Gorgonians belong to the taxonomic class Anthozoa. Unlike hard corals, most gorgonians lack a ridged skeleton and the fan-shaped gorgonians from the Indo-Pacific do not possess the symbiotic dinoflagellates called zooxanthellae (Ref. 30). The taxonomy of gorgonians and sponges on the north-west shelf is incomplete (Ref. 30). Azooxanthallate gorgonians are suspension feeders that rely on currents to transport food, such as small plankton, to their polyps (Ref. 30).

Sponges also rely on currents to transport food, such as plankton and bacteria (Ref. 31). This may explain the dominance of gorgonians and sponges on the ridgeline. Most gorgonians and sponges need to attach to hard substratum, but some species of sponges can burrow into sediment (Ref. 31). This may also explain why cover and densities of these animals are less on the soft substratum compared with the ridgeline.

The ridgeline will support fish communities that may differ to that found on the adjacent soft substratum, but are likely to be similar to other hard substratum on the NWS. According to Last et al (Ref. 32) there are 1,090 species of fishes in Australia’s shelf demersal habitat defined as depths between 40 and 200 m. The exact number found in these depths on the NWS is unclear. Sainsbury et al. (Ref. 33) listed 732 species from shelf waters (30–150 m) between Exmouth and the Gulf of Carpentaria. Allen and Swainston (Ref. 34) listed 1062 species for shelf waters (mainland to outer NWS) of northern WA. Only a small sub-set of these species would be demersal that would largely be restricted to hard substratum. Such species would include groupers (*Epinephelus*) and some species of snapper belonging to the genus *Lutjanus* (Ref. 35).

Seagrasses and macroalgae, which are characteristic of sand habitats and reefs, are unlikely to occur within the Commonwealth waters of the operational area (Ref. 37). This is most likely due to low benthic light levels characteristic of deep waters.

Based on available information, the level of diversity does not appear to be greater in the platform area than the remaining area of the ridgeline (Ref. 29). There are no identified ecologically isolated or regionally significant marine habitats found around the platform or in the operational area (Ref. 29; Ref. 38). Fromont *et al*. (Ref. 36) suggest that similar hard substratum habitats of the region, and adjacent regions, occur along the outer shelf and may include some unique species; however, Project surveys indicate these habitats are well represented regionally (Ref. 29; Ref. 38; Ref. 39; Ref. 40).

This finding was consistent with studies of the shallow Australian sponge fauna, indicating that the environmental factors that influence their distribution are generally related to factors of depth, substratum, and currents (Ref. 36). Regionally, hard substratum occur episodically as an escarpment through the Northwest Shelf Province and Northwest Shelf Transition formations (Ref. 36; Ref. 28) at the 125 m depth mark.

4.3.5.3 Operational Area (fields)

CAPL has conducted extensive surveys within the production licences to understand the nature and composition of habitat and seabed sediments, and thus provide accurate bathymetry for geohazard assessment and engineering design. These surveys comprise high-resolution geophysical surveys, predominantly supported by seabed sampling campaigns. Data from these surveys were interpreted to characterise benthic substrate; the benthic habitat within the OA comprises soft substrate (Figure 4-15). These surveys indicate that the seabed in the OA around the subsea infrastructure such as flowlines and drill centres, mostly comprises unvegetated, soft, and unconsolidated sediments with a low but varying degree of benthic invertebrate habitation (Figure 4-16, Figure 4-17) (Ref. 29).

The shelf of the North-west Marine Region contains several terraces and steps. The most prominent of these features occurs as an escarpment along the NWS and Sahul Shelf at a depth of 125 m, known as the ancient coastline. Parts of the ancient coastline, particularly where it exists as a rocky escarpment, are thought to provide biologically important habitats such as fish communities in areas otherwise dominated by soft sediments (Ref. 41).

Figure 4-4 to Figure 4-6, and Figure 4-8 to Figure 4-10 illustrate habitats over a wide area and distant from the trunkline in order to provide region-wide perspective. These maps are based on the North West Shelf Marine Habitat data (DBCA) and data collected for the Wheatstone baseline study (Ref. 26). The habitats are described in terms of abiotic and biotic types, and are based on the DBCA-defined classification. Abiotic habitats include ‘sandy beach’ while biotic habitats include ‘seagrass’. The complete habitat classification is shown in the legend of each map. Habitat diversity is greatest closer to shorelines, especially around islands. The dominant subtidal habitat is referred to as ‘sand’ and covers large areas between the mainland and islands.

Note that the seaward boundaries of the DBCA-defined habitats (Figure 4-4 to Figure 4-6, and Figure 4-8 to Figure 4-10) are based on State water limits or boundaries of marine protected areas, and thus do not extend to some sections of the trunkline. To predict habitat types between the DBCA-defined habitats and the trunkline, bathymetric contour lines have been overlayed on the figures. The bathymetric contour lines Figure 4-2 to Figure 4-3 suggest an absence of complex seafloor topography (e.g. reefs, shoals etc.) between the seaward boundaries of the DBCA-defined habitats and the trunkline. Instead the bathymetric lines suggest that seafloor in this area is characterised by a gentle slope consistent with the subtidal ‘sand’ habitat defined by DBCA.

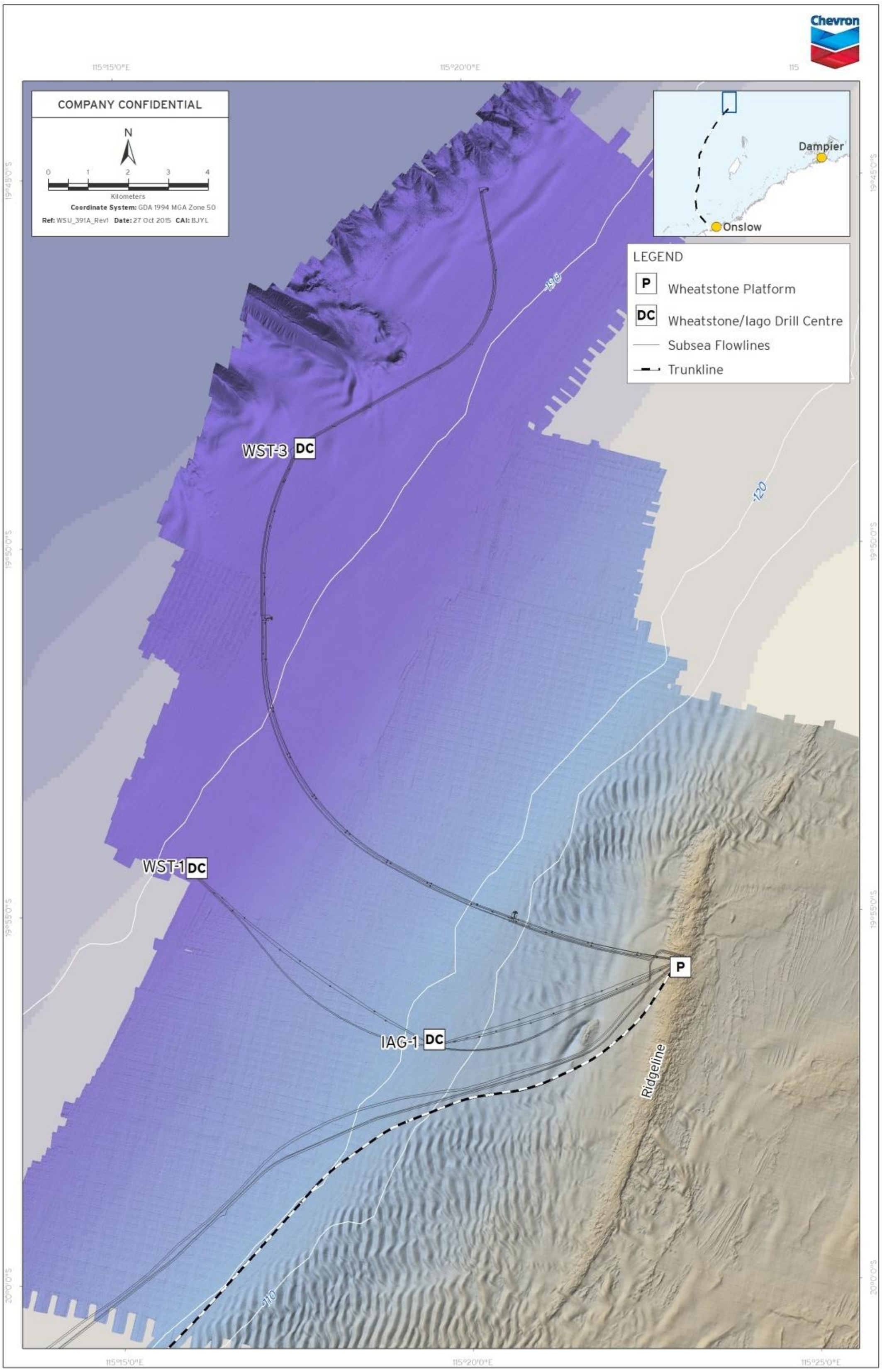


Figure 4-12: Subsea infrastructure relative to the ridgeline

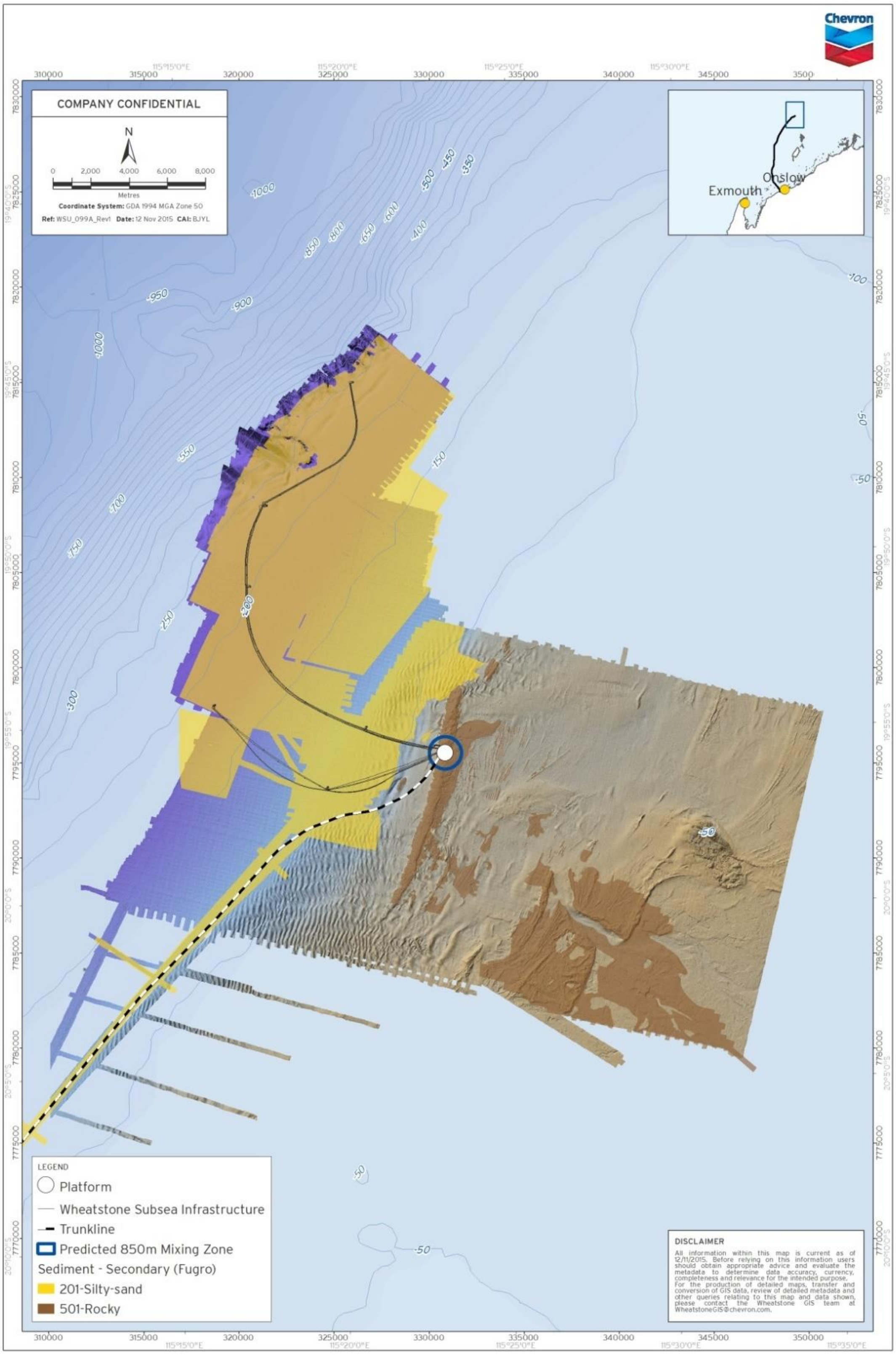
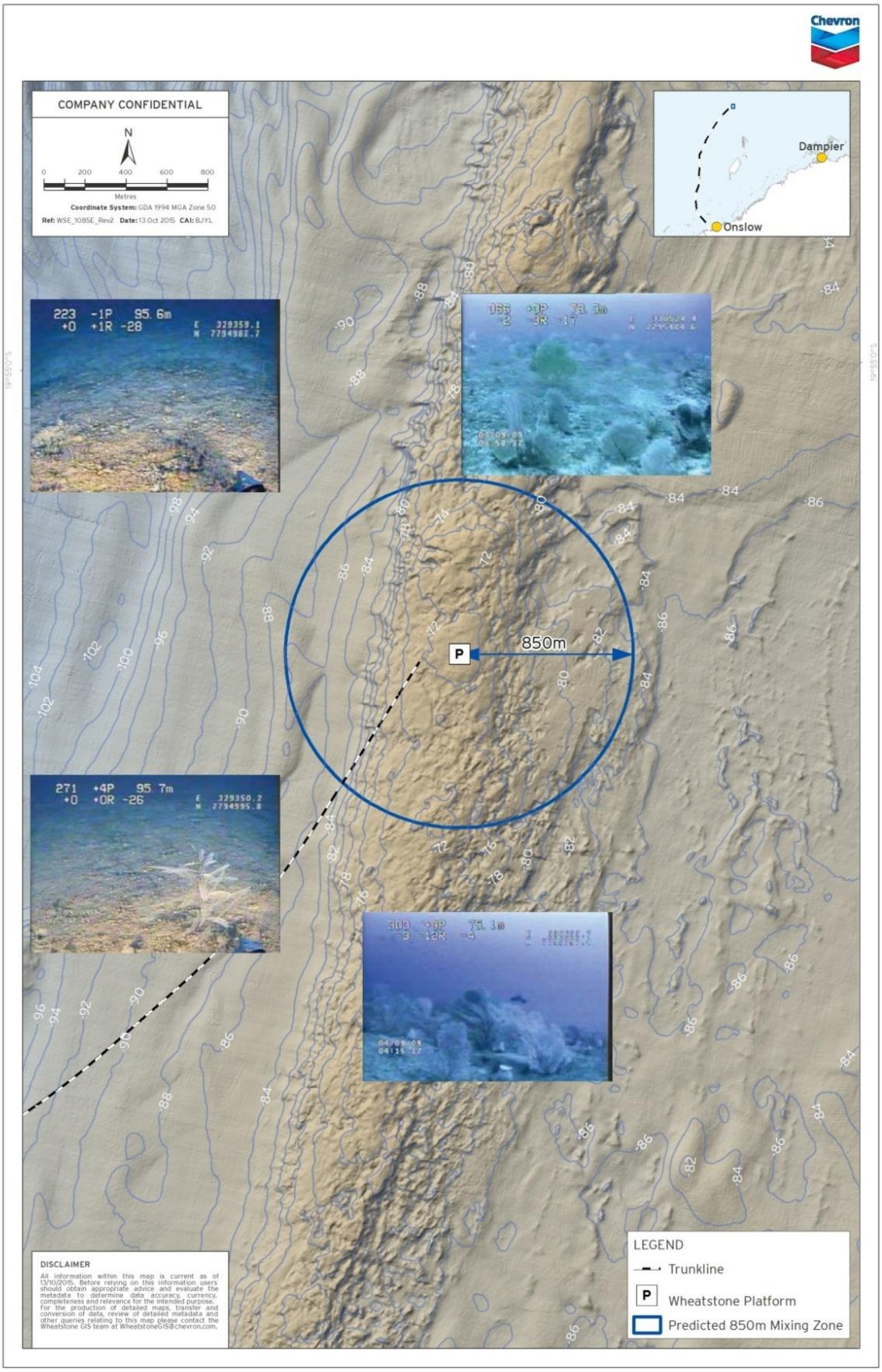


Figure 4-13: Subsea infrastructure, bathymetry, and substratum



Note: representative photographs are shown

Figure 4-14: Common sessile benthic fauna associated with hard substratum of the ridgeline and the adjacent soft substratum

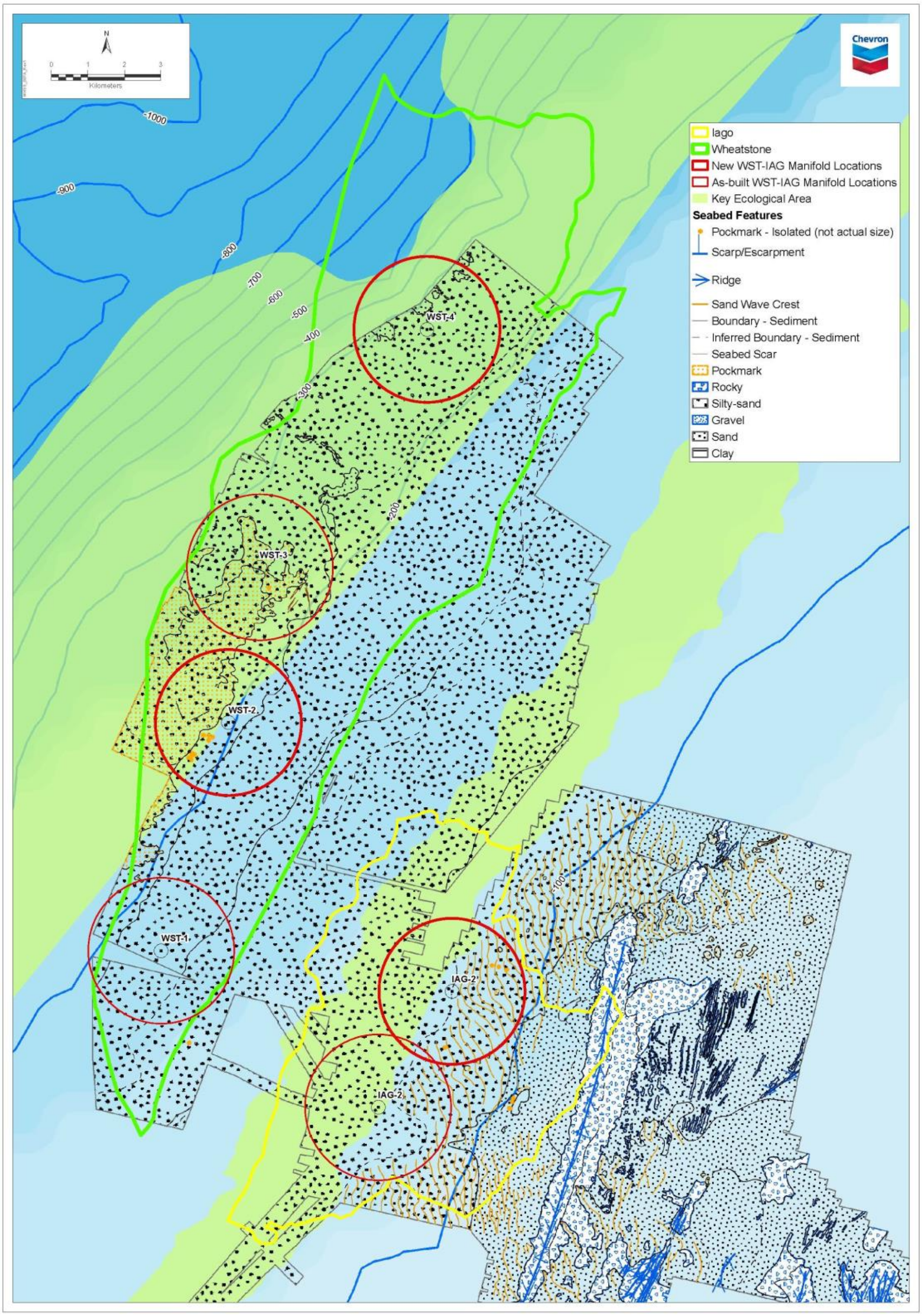


Figure 4-15: Wheatstone and Iago well locations and benthic habitat

Figure 4-16: Seabed survey image showing typical seabed habitat at IAG-1 drill centre

Figure 4-17: Seabed survey image showing typical seabed habitat at WST-3 drill centre

4.3.5.4 Other marine habitat

Marine habitats considered to provide a specific value for matters of national environmental significance as described in CAPL's *Description of the Environment* (Ref. 1; appendix d) were identified within the OA, EMBA, and EEA (Table 4-11).

Table 4-11: Marine habitat and key sensitivities

Matter of national environmental significance	Habitat type					Presence of key value or sensitivity			
	Seagrass	Mangroves	Coral	Saltmarsh	Macroalgae	OA (field)	OA (trunkline)	EMBA	EEA
Mermaid Reef – Rowley Shoals[1]			✓						✓
Ningaloo Coast[2,3]		✓	✓					✓	✓
Ningaloo Marine Area – Commonwealth Waters[1]			✓					✓	✓

1 *Commonwealth Heritage*
2 *National Heritage Place*
3 *World Heritage Property*

4.3.6 Onshore habitats

The small section of the onshore operational area is pre-disturbed (Figure 2-2) as part of an industrial site. The industrial site is the already disturbed area (from previous phases of the Project) and provides little local ecological value. No threatened ecological communities coincide with the onshore area (Ref. 26).

The Interim Biogeographic Regionalisation for Australia (IBRA) categorises the Australian continent into regions of similar geology, landform, vegetation, fauna and climate, referred to as bioregions. Ashburton North is located at the junction between two Interim bioregions: the Carnarvon and Pilbara bioregions, with the majority of Project infrastructure located within the north-eastern corner of the Carnarvon bioregion. The sub-Carnarvon region is distinguished by quaternary coastal beach dunes and mud flats. These tidal mudflats support extensive mangroves, beach dunes with spinifex communities and an extensive mosaic of alluvial plains with samphire and saltbush low shrub-lands. Most of the area is comprised of a sandy surface covered with grasses and low bushes (Coastal Ridge and Longitudinal Dune System).

Environmental groundwater heads indicate water table mounding beneath the dunes and discharge towards the ocean with widely variable salinity, ranging from brackish, saline, to hypersaline.

4.3.6.1 Vegetation

Vegetation units that are in proximity to the onshore operational area of PL99 include CD1 and CD2, both of which are within the Coastal Sand Dunes habitat type (Ref. 42) and CS1/CS2 from the Coastal Sand Plains habitat. These vegetation units are described as being of low local significance as they do not support threatened flora, priority flora or other flora species of interest (Ref. 42). These vegetation units are representative of the vegetation in the locality and are substantially degraded by the invasion of buffel grass (*Cenchrus ciliaris*).

One vegetation unit, CP1, within the Clayey Plains habitat type is described as being of Moderate conservation value, being generally in very good condition and supporting a suite of species specific to this substratum. An additional vegetation unit, ID1 is considered to be of High local conservation significance as it potentially supports Priority Flora (*Eremophila forrestii* subsp. *viridis* and

Triumfetta echinata), species of interest (*Aenictophyton aff. reconditum*), and the dune features would also be particularly susceptible to erosion and weed invasion following disturbance to the soil profile. However, only one flora taxa of conservation interest has been recorded in proximity to the PL99 licence area. Abutilon sp. is an undescribed taxa, which has been recorded from multiple locations within the wider Wheatstone EIS/ERMP vegetation and flora survey area.

Mangroves are of conservation significance. This vegetation unit is discussed further in CAPL's *Description of the Environment* (Ref. 1; appendix d) as part of the shoreline habitats description.

An ecological community is a naturally occurring group of plants, animals and other organisms interacting in a unique habitat. The Minister for Environment may list an ecological community as being threatened (threatened ecological communities [TECs]) if the community is presumed to be totally destroyed or at risk of becoming totally destroyed. Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on the priority list and referred to as priority ecological communities (PECs). No TECs or PECs are located within the OA at Ashburton North. Additionally, no ecological communities listed under the EPBC Act are known to occur within this area.

4.3.6.2 Fauna

Vertebrate Fauna Species

Extensive surveys of terrestrial fauna have been conducted in the vicinity of the Project area, and ten broad fauna habitats were identified (Ref. 42). These habitats were distinguished on the basis of differences in substrate, vegetation, soils and landform. The Wheatstone LNG Fauna Study identified 128 vertebrate species, comprising 51 herpetofauna, 60 avifauna and 17 mammals (Ref. 42). The following six threatened (Schedule 1) vertebrate fauna species (or signs of these species) were recorded:

- Little Northern Freetail Bat (*Mormopterus loriae cobourgensis* [Priority 1])
- Australian Bustard (*Ardeotis australis* [Priority 4])
- Western Pebble-mound Mouse (*Pseudomys chapmani* [Priority 4])
- Rainbow Bee-eater (*Merops ornatus* [Migratory])
- Fork-tailed Swift (*Apus pacificus* [Migratory])
- White-bellied Sea Eagle (*Haliaeetus leucogaster* [Migratory]).

These species are well represented in the wider area. It was concluded that the OA and surrounds does not support significant numbers of migratory waterbirds and studies have also demonstrated that the locality is not an important habitat for migratory bird species (Ref. 26).

Short Range Endemics

Despite thorough searching surveys of suitable habitat for invertebrate groups considered to support short-range endemic taxa, none were identified within the Ashburton North locality (Ref. 26).

Subterranean Fauna

A subterranean fauna study was conducted for the Wheatstone Project with sampling conducted in June, July, September, and October 2009 (Ref. 26). A desktop assessment of the likelihood of subterranean fauna being found within the plant site and within the shared infrastructure corridor was conducted.

No troglobitic fauna were recovered from any of the 96 traps within the 18 bore holes that were sampled. The desktop assessment concluded that there is a low likelihood that the survey area would support a significant troglobitic community as the landforms, stratigraphy and the small amount of habitat space available between the ground surface and the water table are not conducive to troglobitic fauna (Ref. 26). The survey results suggest that a diverse or significant stygal community does not occur in the aquifers beneath the survey area (Ref. 26).

4.4 Commercial interests

4.4.1 Commercial fisheries

Natural and physical resources are described as substances occurring in nature that can be exploited for economic gain. The specific resources considered in this EP include commercial fisheries. CAPL's *Description of the Environment* (Ref. 1; appendix d) identifies and summarises the commercial fisheries.

The State-managed commercial fisheries with fishing effort recorded over a five-year period (2014–2018) (Ref. 43) within areas that overlap the OA, EMBA, and EEA are listed in Table 4-12. Seven fisheries were identified with activity within the vicinity of the OA; these are shown in Figure 4-18 to Figure 4-24.

The Commonwealth-managed commercial fisheries with fishing effort recorded over a five-year period (2014–2018) (Ref. 44) within areas that overlap the OA, EMBA, and EEA are listed in Table 4-13. The only fishery with fishing effort recorded within the OA was the North West Slope Trawl Fishery (Ref. 44). The Southern Bluefin Tuna Fishery is active within waters in the Great Australian Bight and south-eastern Australia (i.e., not within the OA, EMBA, or EEA); however, the spawning grounds for Southern Bluefin Tuna are located in the north-east Indian Ocean (Ref. 44). This indicative spawning area extends into the OA, EMBA, and EEA.

Table 4-12: Presence of recent (2014-2018) fishing effort recorded within State-managed commercial fisheries

Fishery	OA (field)	OA (trunkline)	EMBA	EEA
North Coast Bioregion				
Mackerel Managed Fishery		✓	✓	✓
Nickol Bay Prawn Managed Fishery			✓	✓
Onslow Prawn Managed Fishery		✓	✓	✓
Pilbara Crab Managed Fishery		✓	✓	✓
Pilbara Fish Trawl (Interim) Managed Fishery			✓	
Pilbara Line Fishery	✓	✓	✓	✓
Pilbara Trap Managed Fishery	✓	✓	✓	✓
West Australian Sea Cucumber (Beche-De-Mer) Fishery			✓	✓

Fishery	OA (field)	OA (trunkline)	EMBA	EEA
Gascoyne Bioregion				
Exmouth Gulf Prawn Managed Fishery			✓	✓
Gascoyne Demersal Scalefish Fishery			✓	✓
Shark Bay Crab Fishery				✓
Shark Bay Prawn Managed Fishery				✓
Shark Bay Scallop Managed Fishery				✓
West Coast Deep Sea Crustacean Fishery			✓	✓
West Coast Bioregion				
West Coast Rock Lobster Fishery				✓
West Coast Demersal Scalefish (Interim) Managed Fishery				✓
Statewide				
Marine Aquarium Fish Managed Fishery		✓	✓	✓
Specimen Shell Managed Fishery		✓	✓	✓

Table 4-13: Presence of recent (2014-2018) fishing effort recorded within Commonwealth-managed commercial fisheries

Fishery	OA (field)	OA (trunkline)	EMBA	EEA
North-West Slope Trawl Fishery	✓		✓	✓
Western Deepwater Trawl Fishery			✓	✓
Western Tuna and Billfish Fishery				✓

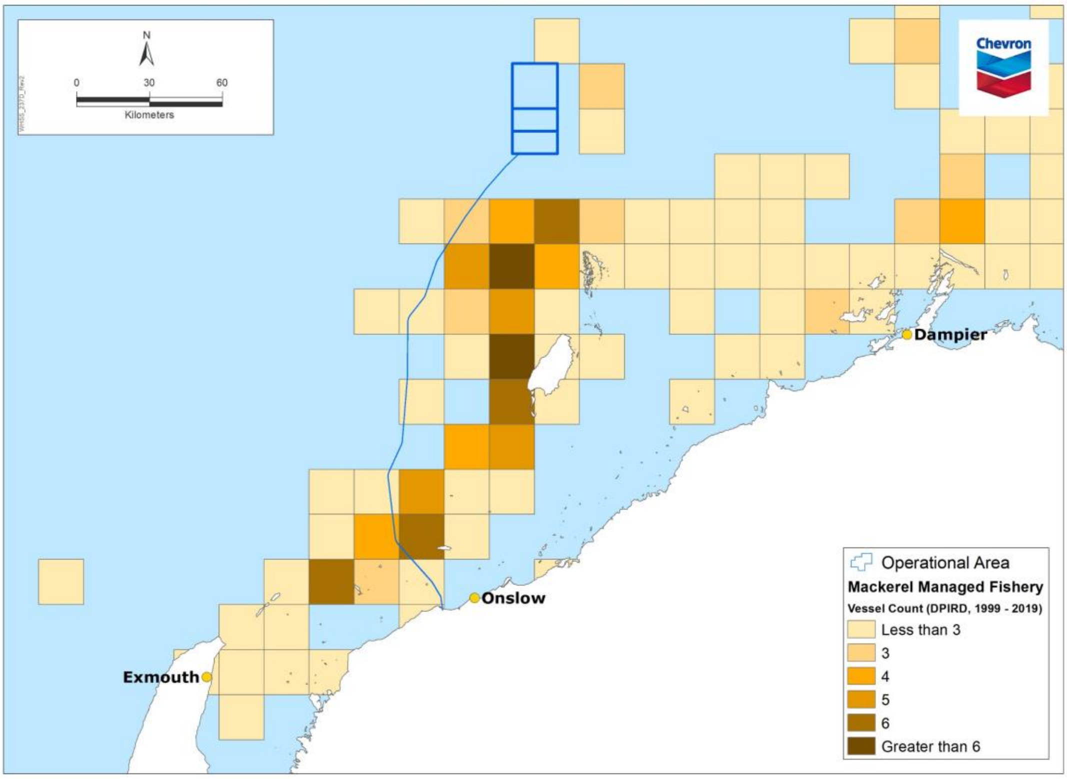


Figure 4-18 Recorded fishing effort for the Mackerel Managed Fishery within the vicinity of the OA

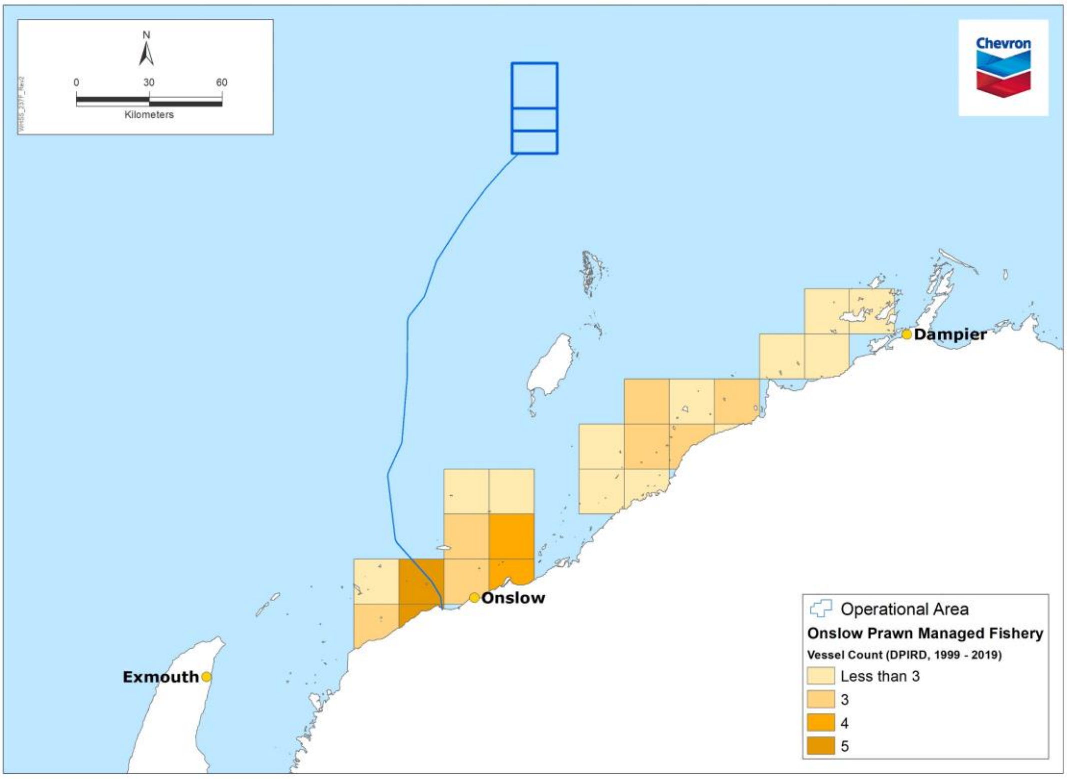


Figure 4-19: Recorded fishing effort for the Onslow Prawn Managed Fishery within the vicinity of the OA

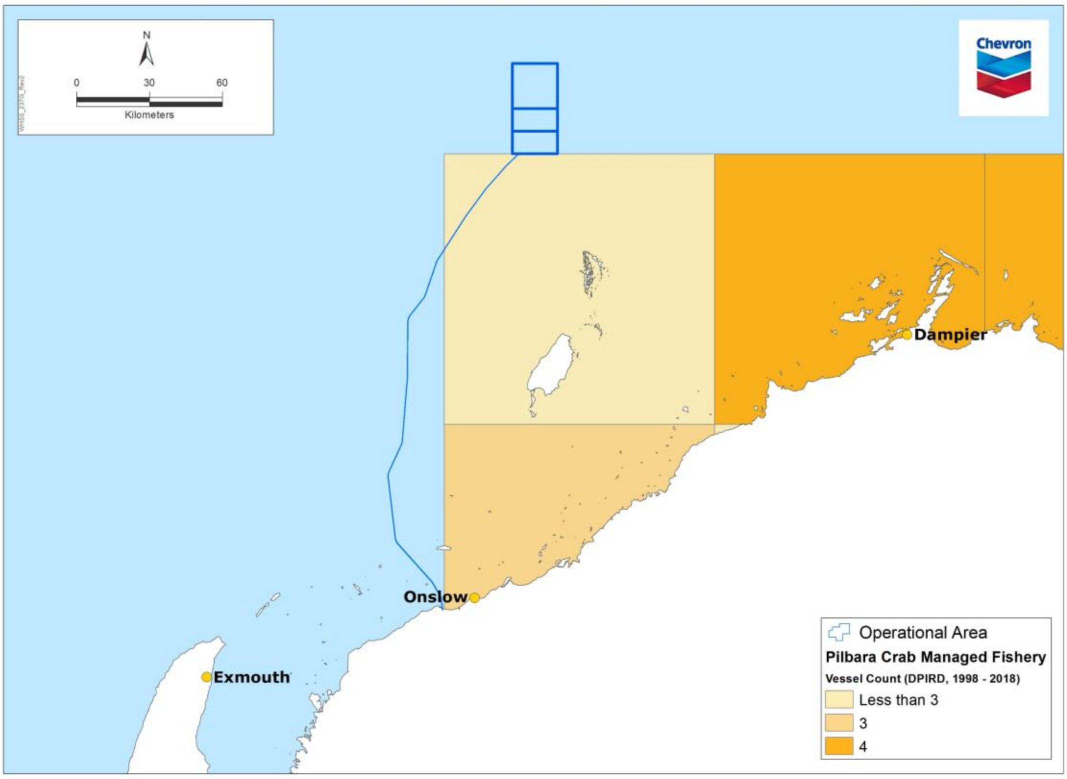


Figure 4-20: Recorded fishing effort for the Pilbara Crab Managed Fishery within the vicinity of the OA

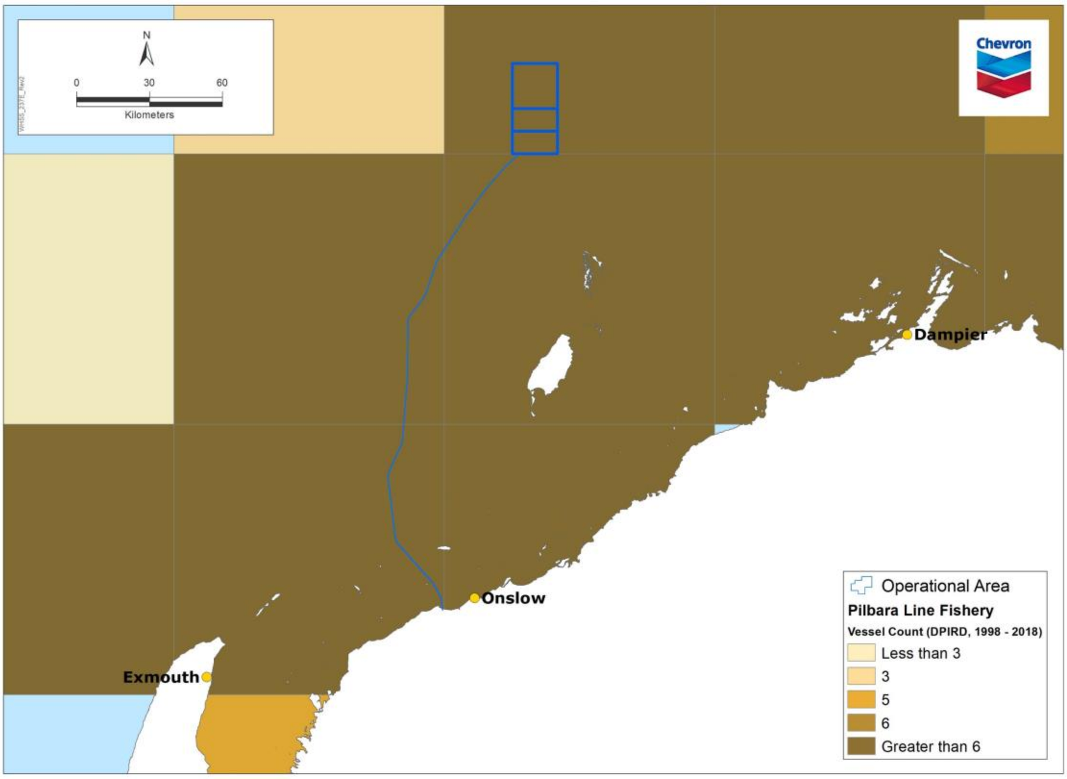


Figure 4-21: Recorded fishing effort for the Pilbara Line Fishery within the vicinity of the OA

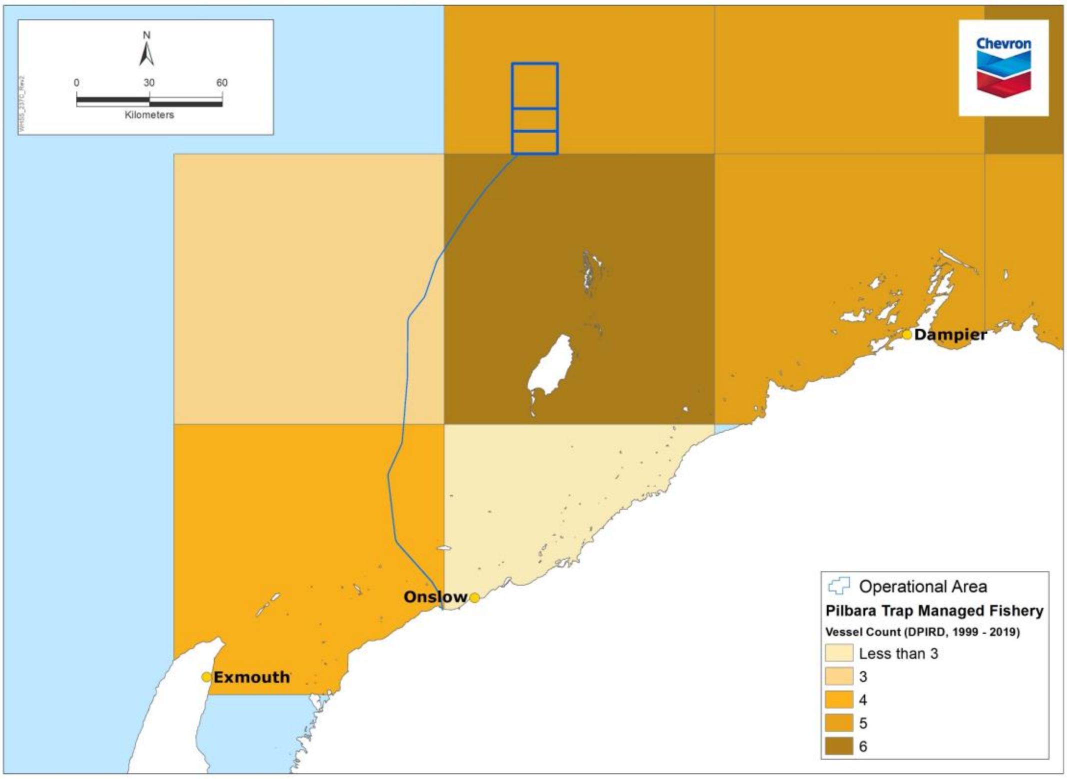
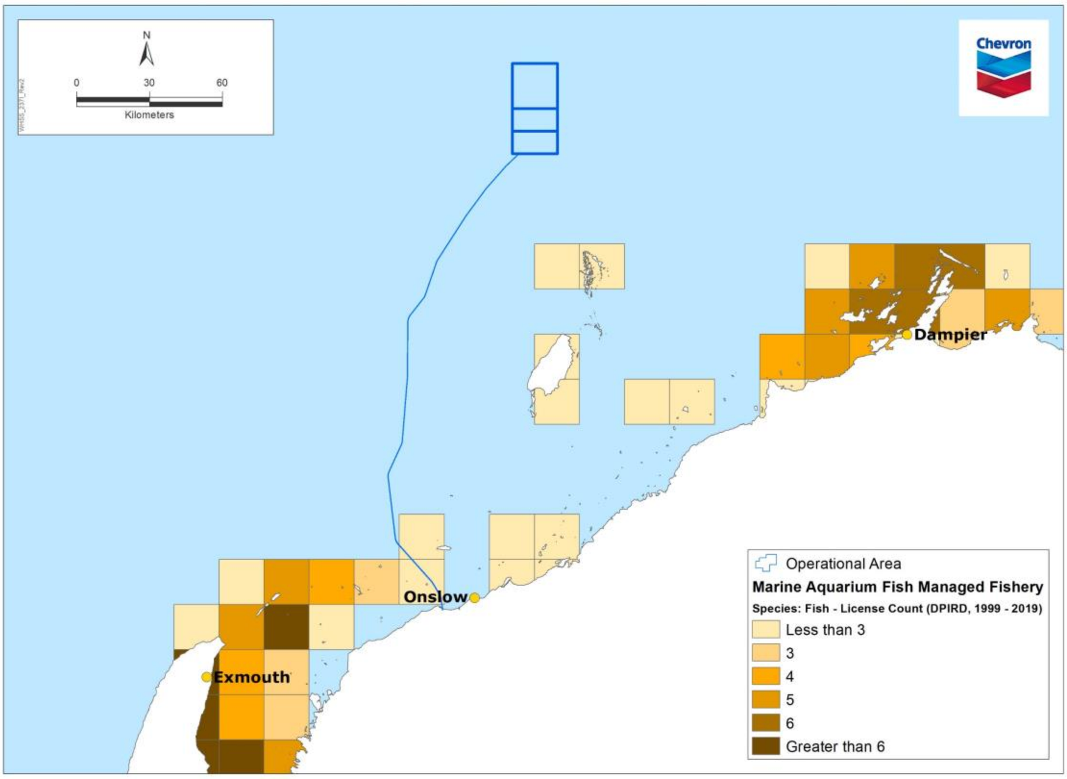


Figure 4-22: Recorded fishing effort for the Pilbara Trap Managed Fishery within the vicinity of the OA



Note: Collection effort shown for fish, and no other components (e.g., corals, invertebrates) of the fishery

Figure 4-23: Recorded fishing effort for the Marine Aquarium Fish Managed Fishery within the vicinity of the OA

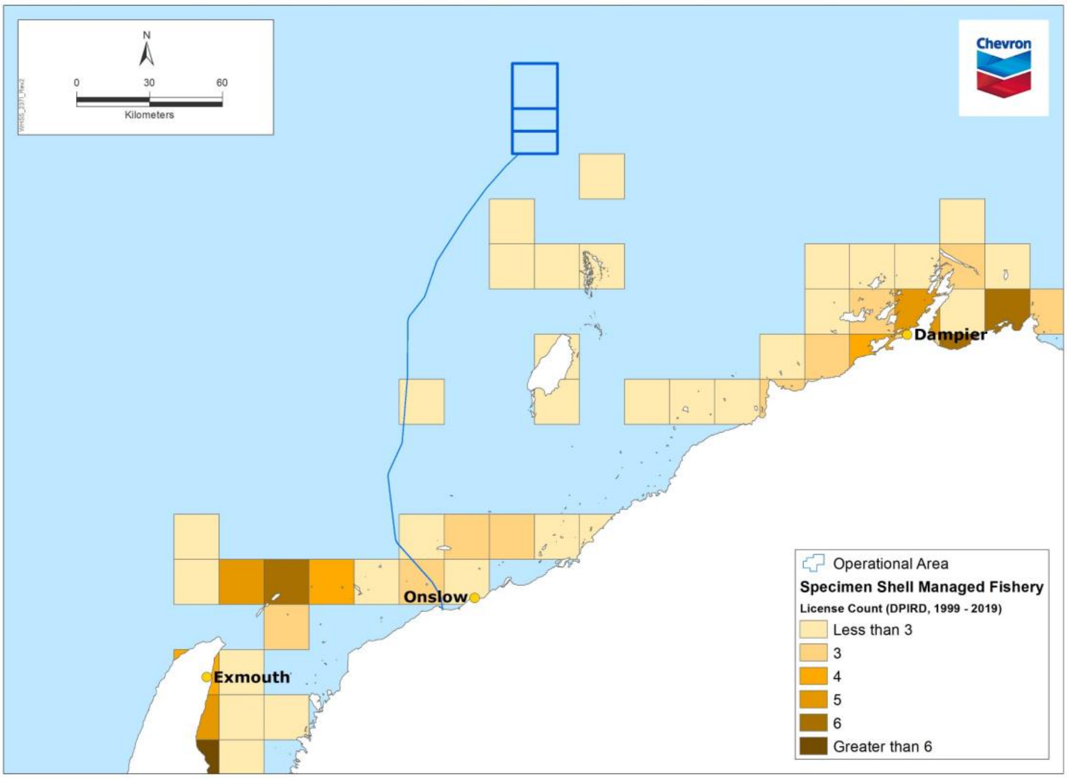


Figure 4-24: Recorded fishing effort for the Specimen Shell Managed Fishery within the vicinity of the OA

4.4.2 Shipping

AMSA collects vessel traffic data from a variety of sources, including satellite shipborne automated identification system (AIS) data, across Australia's Search and Rescue region. This data has been used to develop Figure 4-25, which shows recent vessel traffic within the vicinity of the OA. The figure shows some increased density around CAPL's existing infrastructure, but also shows that the OA is not located within any of the main shipping fairways on the NWS.

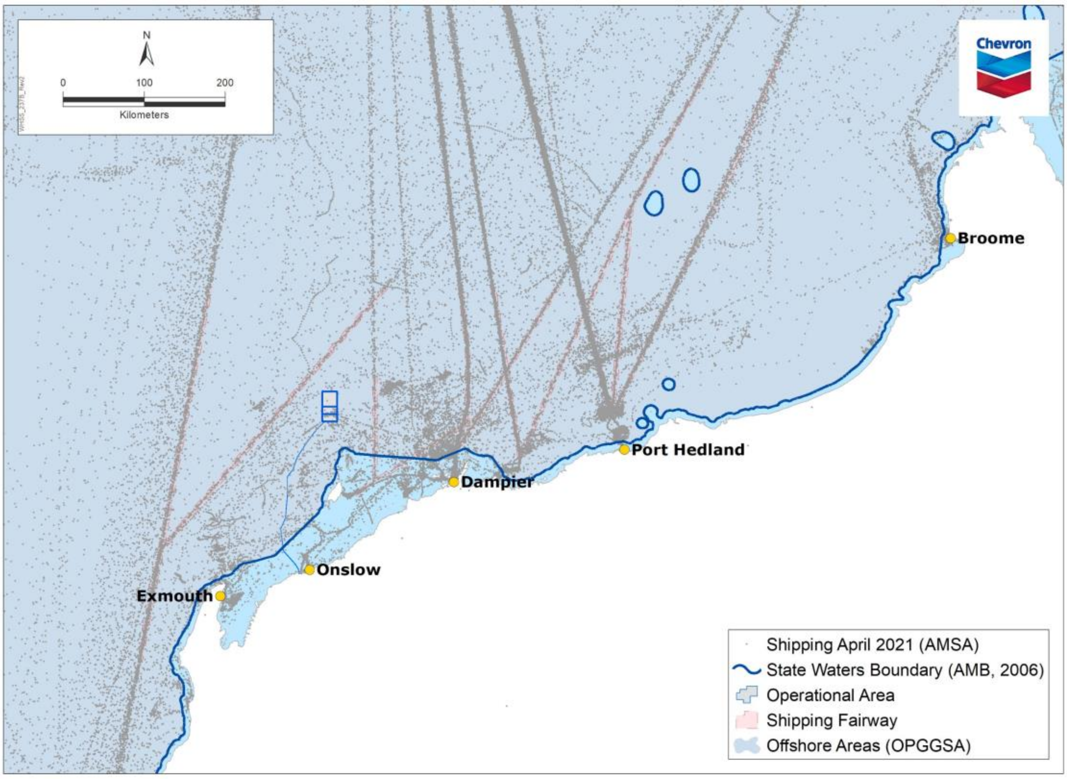


Figure 4-25: Vessel traffic within the vicinity of the OA

4.5 Qualities and characteristics of locations, places, and areas

CAPL's *Description of the Environment* (Ref. 1; appendix d) identifies and describes the qualities and characteristics of the locations, places, and areas that CAPL considers to comprise these receptor groups:

- Ramsar wetlands
- threatened ecological communities (TECs)
- Australian Marine Parks (AMPs)
- key ecological features (KEFs).

There were no Ramsar wetlands or TECs identified within the OA, EMBA, or EEA. The specific presence of AMPs and KEFs within the OA, EMBA, and EEA is detailed in Table 4-14 and Table 4-15 respectively.

The platform is located ~4.3 km from the ancient coastline KEF, and ~15 km from the continental slope demersal fish communities KEF. The trunkline, flowlines, and IAG-1 drill centre cross the ancient coastline at 115–135 m water depth. The WST-3 drill centre is within the continental slope demersal fish communities KEF. ROV surveys showed no benthic habitat in the vicinity of the drill centres, with only unvegetated, unconsolidated sediment without obvious epifauna (Figure 4-16 and Figure 4-17).

Table 4-14: Presence of AMPs

Australian Marine Park	OA (field)	OA (trunkline)	EMBA	EEA
Abrolhos				✓
Argo-Rowley Terrace				✓
Carnarvon Canyon				✓
Gascoyne			✓	✓
Mermaid Reef				✓
Montebello		✓	✓	✓
Ningaloo			✓	✓
Shark Bay				✓

Table 4-15: Presence of KEFs

Key ecological feature	OA (field)	OA (trunkline)	EMBA	EEA
Ancient coastline at 125 m depth contour	✓	✓	✓	✓
Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula			✓	✓
Commonwealth waters adjacent to Ningaloo Reef			✓	✓
Continental slope demersal fish communities	✓		✓	✓
Exmouth Plateau			✓	✓
Glomar Shoals			✓	✓
Mermaid Reef and Commonwealth waters surrounding Rowley Shoals				✓
Meso-scale eddies				✓
Perth Canyon and adjacent shelf break, and other west coast canyons				✓
Wallaby Saddle				✓
Western demersal slope and associated fish communities				✓

4.6 Heritage value of places

CAPL's *Description of the Environment* (Ref. 1; appendix d) identifies and describes the heritage values. The World Heritage properties, National Heritage places, and Commonwealth Heritage places within the OA, EMBA, and EEA are listed in Table 4-16, Table 4-17, and Table 4-18 respectively.

Historic shipwrecks and sunken aircrafts (>75 years old) and other underwater heritage artefacts and sites are protected under the Commonwealth *Underwater Cultural Heritage Act 2018*. The Australasian Underwater Cultural Heritage Database (Ref. 45) identified that no historic shipwrecks are present within the OA, but some do occur within the spatial extent of the EMBA and EEA; and no historic sunken aircrafts were identified within the OA, EMBA, or EEA.

Table 4-16: World Heritage properties

World Heritage properties	OA (field)	OA (trunkline)	EMBA	EEA
The Ningaloo Coast			✓	✓

Table 4-17: National Heritage places

National Heritage properties	OA (field)	OA (trunkline)	EMBA	EEA
HMAS Sydney II and *HSK Kormoran* Shipwreck Sites				✓
The Ningaloo Coast			✓	✓

Table 4-18: Commonwealth Heritage places

Commonwealth Heritage places	OA (field)	OA (trunkline)	EMBA	EEA
HMAS Sydney II and *HSK Kormoran* Shipwreck Sites (External territories list)				✓
Learmonth Air Weapons Range Facility (WA list)			✓	✓
Mermaid Reef – Rowley Shoals (WA list)				✓
Ningaloo Marine Area – Commonwealth Waters (WA list)			✓	✓

5 environmental impact and risk assessment methodology

This section provides a description of the methods used to identify and evaluate the environmental impacts and risks associated with the petroleum activities (as described in Section 3) and any potential emergency conditions associated with these activities.

The impact and risk assessment for this EP was undertaken in accordance with the CAPL's *ABU OE Risk Management Process* (Ref. 46) and using Chevron Corporation's Integrated Risk Prioritization Matrix (Table 5-1). This approach generally aligns with the processes outlined in ISO 31000:2018 *Risk management – Principles and guidelines* (Ref. 47) and the HB 203:2012 *Managing environment-related risk* (Ref. 48).

The impact and risk assessment process and evaluation involved consulting with environmental, health, safety, commissioning, start-up, operations, maintenance, engineering, and emergency response personnel. The impacts and risks considered and covered in this EP were identified and informed by:

- experience gained during the GFP
- expertise and experience of CAPL personnel involved in operations
- stakeholder engagement (Section 2.6).

5.1 Identification and description of the petroleum activity

All components of the petroleum activity and potential emergency conditions relevant to the scope of this EP were described and evaluated during the risk assessment. The activity is described in detail in Section 3.

5.2 Identification of particular environmental values and sensitivities

The presence of environmental values and sensitivities within the OA, EMBA, and wider EEA is documented in Section 4, with the values and sensitivities further described in CAPL's *Description of the Environment: CAPL Planning Area* (Ref. 1; appendix d). CAPL considers the particular values and sensitivities to be:

- the world heritage values of a declared World Heritage property within the meaning of the EPBC Act
- the national heritage values of a National Heritage place within the meaning of the EPBC Act
- the ecological character of a declared Ramsar wetland within the meaning of the EPBC Act
- the presence of a listed threatened species or listed threatened ecological community within the meaning of the EPBC Act
- the presence of a listed migratory species within the meaning of the EPBC Act
- any values and sensitivities that exist in, or in relation to, part or all of:
  - a Commonwealth marine area within the meaning of the EPBC Act
  - Commonwealth land within the meaning of the EPBC Act.

Because many protected, rare, or endangered fauna have the potential to transit through the OA, EMBA, and wider EEA, the habitat and/or temporal area that supports protected and endangered fauna (including areas defined as BIAs for these species) is considered the particular value or sensitivity.

5.3 Identification of relevant aspects

CAPL defines an aspect as an element of CAPL's activities, products, or services related to an operation that has the potential to interact with the environment at present or later (e.g., wastewater discharge, greenhouse gas emission, legacy environmental obligations).

After describing the petroleum activity, an assessment was carried out to identify potential interactions between the petroleum activity and the receiving environment. The outcomes of stakeholder consultation also contributed to this scoping process.

Note: Potential interactions with safety, health, and assets is outside the scope of this EP.

Environmental aspects categorised for use in the impact and risk assessment of this petroleum activity include:

- physical presence
- seabed or ground disturbance
- air emissions
- dust emissions
- light emissions
- underwater sound
- invasive marine pests or non-indigenous species
- planned discharges
- unplanned releases.

5.4 Identification of relevant environmental impacts and risks

Potential impacts and risks arising from the aspects were then identified during a scoping exercise and then evaluated in detail.

5.5 Evaluation of impacts and risks

5.5.1 Consequence

After identifying the aspects, and associated potential impacts and risks, the potential consequences were evaluated using the Integrated Risk Prioritization Matrix (Table 5-1). The consequence level is determined by considering:

- the spatial scale or extent of potential interactions within the receiving environment
- the nature of the receiving environment (within the spatial extent), including proximity to sensitive receptors, relative importance, and sensitivity or resilience to change
- the impact mechanisms (cause and effect) of the aspect within the receiving environment (e.g., persistence, toxicity, mobility, bioaccumulation potential)
- the duration and frequency of potential effects and time for recovery
- the potential degree of change relative to the existing environment or to acceptability criteria.

For aspects that have the potential to cause both impacts and risks, the highest level consequence was carried through the remainder of the assessment to ensure the most conservative analysis is presented.

Table 5-1: Chevron Corporation's Integrated Risk Prioritization Matrix

Likelihood Descriptions	Expected to occur	Likely	1	6	5	4	3	2	1
	Conditions may allow to occur	Occasional	2	7	6	5	4	3	2
	Exceptional conditions may allow to occur	Seldom	3	8	7	6	5	4	3
	Reasonable to expect will not occur	Unlikely	4	9	8	7	6	5	4
	Has occurred once or twice in the industry	Remote	5	10	9	8	7	6	5
	Rare or unheard of	Rare	6	10	10	9	8	7	6
Consequence Descriptions				6	5	4	3	2	1
				Incidental	Minor	Moderate	Major	Severe	Catastrophic
				Limited environmental impact	Localised, short-term environmental impact	Localised, long-term environmental impact	Short-term, widespread environmental impact	Long-term widespread environmental impact	Persistent landscape-scale environmental impact

5.5.2 Control Measures and ALARP

The process for identifying control measures depends on the ‘as low as reasonably practicable’ (ALARP) decision context set for that particular aspect. Regardless of the process, control measures are assigned in accordance with the defined environmental performance outcomes, with the objective to eliminate, prevent, reduce, or mitigate consequences associated with each identified environmental impact and risk.

5.5.2.1 ALARP Decision Context

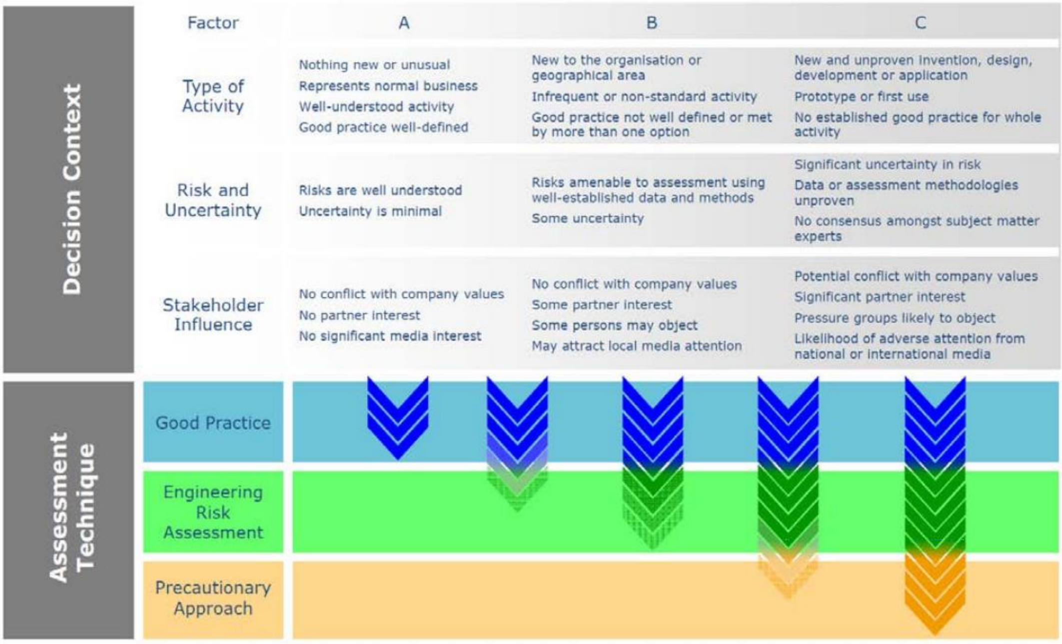
In alignment with NOPSEMA’s ALARP guidance note (Ref. 49), CAPL has adapted the approach developed by Oil and Gas UK (OGUK) (Ref. 50) for use in an environmental context to determine the assessment technique required to demonstrate that impacts and risks are ALARP. Specifically, the framework considers the magnitude of impacts and risks along with these guiding factors:

- activity type
- risk and uncertainty
- stakeholder influence.

A Type A decision (Figure 5-1) is made for lower-order impacts and risks (Table 5-3) where they are relatively well understood, activities are well-practised, and there is no significant stakeholder interest. However, if good practice is not sufficiently well defined, additional assessment may be required. In addition, where an aspect associated with the activity is listed as either a key threat to a protected matter under a document made or implemented under the EPBC Act (such as recovery plans, conservation management plans, or a conservation advice), or identified as an aspect of concern to a listed conservation value under an EPBC Act marine bioregional plan, and can result in a credible impact or risk to these sensitivities, additional control consideration will be undertaken.

A Type B decision (Figure 5-1) is made for higher-order impacts and risks (Table 5-3) if there is greater uncertainty or complexity around the activity, and there are relevant concerns from stakeholders. In this instance, established good practice is not considered sufficient and further assessment is required to support the decision and ensure the risk is ALARP.

A Type C decision (Figure 5-1) typically involves sufficient complexity, higher-order impact and risks (Table 5-3), uncertainty, or stakeholder interest to require a precautionary approach. In this case, relevant good practice still has to be met, additional assessment is required, and the precautionary approach must be considered for those controls that only have a marginal cost benefit.



(Source: Ref. 49)

Figure 5-1: ALARP decision support framework

In accordance with the regulatory requirement to demonstrate that environmental impacts and risks are ALARP, CAPL has considered the above decision context in determining the level of assessment required. This is applied to each aspect described in Sections 6 and 7. The assessment techniques considered include:

- good practice
- engineering risk assessment
- precautionary approach.

5.5.2.2 Good practice

OGUK (Ref. 50) defines 'good practice' as:

> *The recognised risk management practices and measures that are used by competent organisations to manage well-understood hazards arising from their activities.*

Good practice can also be used as the generic term for those measures that are recognised as satisfying the law. For this EP, sources of good practice include:

- requirements from Australian legislation and regulations
- relevant Commonwealth government policies
- relevant Commonwealth government guidance
- relevant industry standards
- relevant international conventions.

If the ALARP technique is determined to be good practice, further assessment (an engineering risk assessment) is not required to identify additional controls. However, additional controls that provide a suitable environmental benefit for an insignificant cost have been identified.

5.5.2.3 Engineering risk assessment

All impacts and risks that require further assessment are subject to an engineering risk assessment. Based on the various approaches recommended by OGUK (Ref. 50), CAPL believes the methodology most suited to this activity is a comparative assessment of risks, costs, and environmental benefit. A cost–benefit analysis should show the balance between the risk benefit (or environmental benefit) and the cost of implementing the identified measure, with differentiation required such that the benefit of the risk-reduction measure can be seen and the reason for the benefit understood.

5.5.2.4 Precautionary Approach

After considering all available engineering and scientific evidence, OGUK (Ref. 50) state that if the assessment is insufficient, inconclusive, or uncertain, then a precautionary approach to hazard management is needed. A precautionary approach will mean that uncertain analysis is replaced by conservative assumptions that will result in control measures being more likely to be implemented.

That is, environmental considerations are expected to take precedence over economic considerations, meaning that a control measure that may reduce environmental impact is more likely to be implemented. In this decision context, the decision could have significant economic consequences to an organisation.

5.5.3 Likelihood

For environmental impacts (where there is a planned emission or discharge resulting in a known change to the environment) likelihood is not considered.

For risks where the aspect or event may lead to environmental impacts under certain circumstances, the likelihood (probability) of the defined consequence occurring is determined. The likelihood is considered on the assumption that all control measures are in place. The likelihood of a consequence occurring was identified using one of the six likelihood categories shown in Table 5-1.

5.5.4 Quantification of the level of risk

The Integrated Risk Prioritization Matrix (Table 5-1) was applied during an environmental risk assessment workshop. This matrix uses consequence and likelihood rankings of 1 to 6, which when combined, result in a risk level between 1 (highest risk) and 10 (lowest risk). Risk assessment outcomes are based solely on assessment of risk to the environment.

5.6 Impact and risk acceptance criteria

NOPSEMA provides guidance on demonstrating that impacts and risks will be of an ‘acceptable level’ (Ref. 12). This guidance indicates that an acceptable level is the level of impact or risk to the environment that may be considered broadly acceptable with regard to all relevant considerations, including:

- principles of ecologically sustainable development (ESD)
- legislative and other requirements (including laws, policies, standards, conventions)
- matters protected under Part 3 of the EPBC Act, consistent with relevant policies, guidelines, threatened species recovery plans, management plans, management principles etc.

- internal context (titleholder policy, culture, processes, standards and systems)
- external context (existing environment, stakeholder expectations).

5.6.1 Principles of ESD and precautionary principle

The principles of ESD are considered in Table 5-2 in relation to acceptability evaluations.

Under the EPBC Act, the Minister must also take into account the precautionary principle in determining whether or not to approve the taking of an action. The precautionary principle (Section 391(2) of the EPBC Act) is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there may be threats of serious or irreversible environmental damage.

Table 5-2: Principles of ESD in relation to petroleum activity acceptability evaluations

Principles of ESD	How they have been applied
(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations	CAPL's impact and risk assessment process integrates long-term and short-term economic, environmental, social, and equitable considerations. This is demonstrated through the Integrated Risk Prioritization Matrix (Table 5-1), which includes provision for understanding the long-term and short-term impacts associated with its activities, and the ALARP process, which balances the economic cost against environmental benefit. As this principle is inherently met by applying the EP assessment process, it is not considered separately for each evaluation.
(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	Consider if there is serious or irreversible environmental damage (i.e., consequence level between Major [3] and Catastrophic [1]). If so, assess whether there is significant uncertainty associated with the aspect.
(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	The risk assessment methodology ensures that impacts and risks are reduced to levels that are considered ALARP. If the impacts and risk are determined to be serious or irreversible, the precautionary principle is implemented to ensure that risks are managed to ensure 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	Not considered relevant for petroleum activity acceptability demonstrations.

5.6.2 Defining an acceptable level of impact and risk

Following NOPSEMA's ALARP Guidance Note (Ref. 49), CAPL has applied the approach that lower-order environmental impacts or risks (Table 5-3) assessed as Decision Context A are 'broadly acceptable', while higher-order environmental impacts or risks determined to be Decision Context B or C require further evaluation against a defined acceptable level because they are not inherently ‘broadly acceptable’. However, in alignment with NOPSEMA’s decision making guidance (Ref. 12) even where the impact or risk is evaluated as being a lower-order impact or risk, but the aspect associated with the activity is listed as a threat to a protected matter under a document made or implemented under the EPBC Act, or identified as an aspect of concern to a listed conservation value under an EPBC Act Marine Bioregional Plans, and can result in a credible impact or risk, CAPL will define an acceptable level of impact and risk in accordance with a document made or implemented under the EPBC Act.

Table 5-3: CAPL definition of lower- and higher-order impacts and risks

Magnitude	Impacts	Risk	Decision context
Lower-order	Consequence Level: 4–6	Risk Level: 7–10	A
Higher-order	Consequence Level: 1–3	Risk Level: 1–6	B or C

CAPL will considers these types of documents when defining the acceptable level of impact or risk:

- bioregional plans
- AMP plans
- conservation advice
- recovery plans
- government guidelines.

The objectives of the documents are identified and, having regard for the described activity, CAPL will set an acceptable level of impact that aligns with these objectives. Where the impact arising from the activity is inconsistent with the defined level (or objectives of the relevant documents), it is unacceptable.

5.6.3 Summary of acceptance criteria

Table 5-4 outlines the criteria that CAPL used to demonstrate that impacts and risks from each identified aspect are acceptable.

Table 5-4: Acceptability criteria

Acceptability Test	
Principles of ESD	Is there the potential to affect biological diversity and ecological integrity? Do activities have the potential to result in permanent/irreversible, medium-large scale, and/or moderate-high intensity environmental damage?
	If yes: Is there significant scientific uncertainty associated with the aspect?
	If yes: Are there additional measures to prevent degradation of the environment from this aspect?
Relevant environmental legislation and other requirements	Confirm that impact and risk management is consistent with relevant Australian environmental management laws and other regulatory / statutory requirements.

Acceptability Test	
Internal context	Confirm that all good practice control measures were identified for this aspect through CAPL's management systems and that impact and risk management is consistent with company policy, culture, and standards.
External context	What objections and claims regarding this aspect were made, and how were they considered / addressed?
Defined acceptable level	Is the impact and risk broadly acceptable (i.e. Decision Context A)?
	If no: For higher-order environmental impacts and risks (Decision Context B or C), what is the defined level of impact, and does the activity meet this level?

5.7 Environmental performance outcomes, standards, and measurement criteria

Environmental performance outcomes, performance standards, and measurement criteria were defined to address the environmental impacts and risks identified during the risk assessment.

CAPL is committed to conducting activities associated with the petroleum activity in an environmentally responsible manner and aims to implement best practice environmental management as part of a program of continual improvement to reduce impacts and risks to ALARP. CAPL defines environmental performance outcomes, standards, and measurement criteria that relate to managing the identified environmental risks as:

- **Environmental performance outcomes**—are the level of performance in managing the potential environmental impacts and risks from each petroleum activity
- **Environmental performance standards**—are measurable statements of performance of a system, item of equipment, person, or procedure that are used to manage environmental impacts and risks for the duration of the petroleum activity
  - These statements will consider the effectiveness of the control measures, and, in accordance with NOPSEMA's decision making guidance (Ref. 12), effectiveness will be considered with regards to the controls' functionality, availability, reliability, survivability, independence, and compatibility with other control measures
- **Measurement criteria**—compliance and assurance statement or records that detail how CAPL enacts the outlined performance standard; these are used to determine whether the environmental performance outcomes and standards were met and whether the implementation strategy was complied with. If no practicable quantitative target exists, a qualitative criterion is set.

6 environmental impact and risk assessment and management—petroleum activity

This section provides an evaluation of the impacts and risks associated with the petroleum activity appropriate to the nature and scale of each impact and risk, details the control measures that are used to reduce the risks to ALARP and to an acceptable level, and identifies the associated environmental performance outcomes, performance standards, and measurement criteria.

Table 6-1 summarises the impacts and risks that were identified and evaluated for this activity.

Table 6-1: Summary of impact and risk evaluation—petroleum activity

Section	Aspect	Impact	Risk			Decision context	ALARP	Acceptable
		C^	C^	L	R			
Hydrocarbon system								
6.1.1	Physical presence—Other marine	–	6	4	9	A	Yes	Yes
6.1.2	Planned discharges—Subsea operations	6	6	5	10	A	Yes	Yes
6.1.3	Unplanned release—Loss of containment	–	6	4	9	A	Yes	Yes
Platform								
6.2.1	Physical presence—Other marine users	–	6	4	9	A	Yes	Yes
6.2.2	Air emissions	6	–	–	–	A	Yes	Yes
6.2.3	Light emissions	6	6	5	10	A	Yes	Yes
6.2.4	Underwater sound	6	–	–	–	A	Yes	Yes
6.2.5	Planned discharges—Produced water	4	4	5	8	A	Yes	Yes
6.2.6	Planned discharges—Wastewater	5	6	5	10	A	Yes	Yes
6.2.7	Unplanned release—Waste	–	6	5	10	A	Yes	Yes
6.2.8	Unplanned release—Loss of containment	–	6	4	9	A	Yes	Yes
IMR								
Subsea								
6.3.1.1	Seabed disturbance	5	–	–	–	A	Yes	Yes
6.3.1.2	Underwater sound	5	5	6	10	A	Yes	Yes
6.3.1.3	Planned discharges—Subsea operations	6	6	6	10	A	Yes	Yes
6.3.1.4	Unplanned release—Loss of containment	–	6	5	10	A	Yes	Yes
Onshore								
6.3.2.1	Physical presence—Terrestrial fauna	–	5	5	9	A	Yes	Yes

Section	Aspect	Impact	Risk			Decision context	ALARP	Acceptable
		C^	C^	L	R			
6.3.2.2	Ground disturbance	–	–	–	–	–	–	–
6.3.2.3	Dust emissions	–	–	–	–	–	–	–
6.3.2.4	Light emissions	–	–	–	–	–	–	–
6.3.2.5	Non-indigenous species	–	5	6	10	A	Yes	Yes
6.3.2.6	Unplanned release—Loss of containment	–	6	4	9	A	Yes	Yes
Field support								
6.4.1	Physical presence—Other marine users	–	6	5	10	A	Yes	Yes
6.4.2	Physical presence—Marine fauna	–	6	5	10	A	Yes	Yes
6.4.3	Seabed disturbance	6	–	–	–	A	Yes	Yes
6.4.4	Air emissions	6	–	–	–	A	Yes	Yes
6.4.5	Light emissions	6	6	5	10	A	Yes	Yes
6.4.6	Underwater sound	5	5	6	10	A	Yes	Yes
6.4.7	Invasive marine pests	–	2	6	7	A	Yes	Yes
6.4.8	Planned discharges—Vessel operations	6	6	6	10	A	Yes	Yes
6.4.9	Unplanned release—Waste	–	6	5	10	A	Yes	Yes
6.4.10	Unplanned release—Loss of containment	–	5	5	9	A	Yes	Yes

C = Consequence; L = Likelihood; R = Risk level

^ For aspects identified as causing both impacts and risks, the highest-level consequence was evaluated in detail to ensure that justification is provided to support the highest consequence level for the aspect

6.1 Hydrocarbon system

6.1.1 Physical presence—Other marine users

Source

Activities identified as having the potential to result in an interaction with other marine users are:

- permanent presence of the subsea hydrocarbon system within the OA.

Potential impacts and risks

Impacts	C	Risks	C
N/A	-	Unplanned interactions with other marine users may result in: • entanglement of trawl fishing gear on subsea infrastructure.	6

Consequence evaluation

The subsea hydrocarbon infrastructure associated with this activity is contained wholly within the OA. The field OA consists of an area of ~650 km^2, and the trunkline is ~221 km long.

The potential for unplanned interactions between other marine users with the subsea hydrocarbon system is limited to where these users interact with the seafloor. Marine users that have the potential to interact with the subsea infrastructure are limited to commercial fisheries that utilise trawling fishing methods. The potential risks to trawling vessels from subsea infrastructure includes disruption to fishing efforts caused by the need for vessels to avoid the infrastructure and physical damage to trawling gear that contacts the hydrocarbon system.

As identified in Section 4.4.1, one Commonwealth managed commercial trawl fishery (North West Slope Trawl Fishery) has a management area that overlaps with the OA. The extent to which the hydrocarbon system infrastructure overlaps this trawl fishery management area is <1%. Fishing activity within the Commonwealth trawl fisheries is restricted to waters >200 m water depth. The fishery also has only a small number of active permits (e.g., six within the 2017-2018 season [Ref. 1; appendix d]).

As identified in Section 4.4.1, one State managed commercial trawl fishery (Onslow Prawn Fishery) has a management area that overlaps with the OA. The extent to which the hydrocarbon system infrastructure overlaps this trawl fishery management area is <1%. The fishery also has only a small number of active vessels and fishing effort is only recorded within the trunkline OA (Figure 4-19).

Subsea infrastructure has been in place within the OA for several years (installation completed in 2015), and to date, no incidences of commercial fishing activities interacting with the infrastructure has been communicated to CAPL. Consequently, the continued presence of the hydrocarbon system infrastructure is not expected to result in a significant impact to commercial trawl fishing operations (via loss of catches or damage to fishing equipment). Any deviation required by trawling vessels around the subsea infrastructure is not expected to impact on the functions, interests, or activities of other marine users (as confirmed by stakeholder consultation records).

In summary, the physical presence of the hydrocarbon system is not expected to cause significant impacts to other marine users, and the risks are considered limited with potential consequences. Therefore, CAPL has ranked the potential consequence to other marine users from physical presence as Incidental (6).

ALARP decision context justification

The operation of subsea infrastructure is commonplace and well-practised nationally and internationally. The control measures to manage the risks associated with unplanned interactions with other marine users are well defined and understood by the industry.

During stakeholder consultation, no objections or claims were raised regarding disturbance/disruption to other marine users arising from the petroleum activity.

The risks arising from the physical presence of subsea infrastructure and support vessels to other marine users are considered lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source		
Control measure	**Source**	
Stakeholder engagement	Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information. Communicating the activity details, location, and presence of vessels to other marine users ensures they are informed and aware, thereby reducing the risk of unplanned interactions.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	The subsea infrastructure is located in areas of low commercial trawl fishing activity and covers only a small percentage of fishery management areas. Interaction with subsea infrastructure is expected to be limited based upon operating experience over the past five years. As such, CAPL consider that the likelihood of the consequence occurring is Unlikely (4).	
Risk level	Very low (9)	
Determination of acceptability		
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing incidental disruption to other marine users, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with other marine users arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to other marine users from petroleum activities	**Stakeholder engagement** Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information	Stakeholder consultation records

6.1.2 Planned discharges—Subsea operations

Source			
Activities identified as having the potential to result in planned subsea operational discharges are: • start-up and operations of the hydrocarbon system. The planned subsea operational discharges include small volumes of control fluids (from the subsea valves).			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Planned subsea operational discharges may result in: • localised and temporary reduction in water quality.	6	A change in ambient water quality may result in: • indirect impacts to fauna arising from chemical toxicity	6
Consequence evaluation			
Localised and temporary reduction in water quality Subsea operational fluid discharges are intermittent, non-continuous, and of short duration, and as such frequency of exposure is limited. Depending on the hydrocarbon system operating conditions, the frequency of valve actuations may range from less than daily to up to several times a day for each valve. Discharge volumes are expected to range from 0.001–0.03 m^3 per discharge, with predicted total volumes from any tree or manifold expected to be ~1–5 m^3 per year, equating to ~15–70 m^3 per year (Section 3.2.2.3). The valve discharges occur at the wells or near the drill centres, at water depths of ~119–240 m, and typically 5–7 m above the seabed (based on the size of the infrastructure). Due to the small discharge volumes within open marine waters (which are typically influenced by large-scale ocean currents and tides [Ref. 77]), rapid dispersion of fluids is expected to occur and the spatial extent of the discharges is expected to be limited to a small area in the water column around the source. The control fluids comprise primarily a water/glycol mix, at a typical ratio of ~40/60%, excluding minor concentrations of up to ~5% proprietary additives. The reduction in water quality caused by this release is temporary, as these discharges would dilute, disperse, and neutralise rapidly upon release. Based on nearfield dilution modelling, which considers currents, water column depth, discharge height above seabed, physical characteristics of the typical control fluids, and flow rates, a dilution of over 1:500 is anticipated within close proximity to the valve and before any fluids contact any seabed habitats (Ref. 78). As subsea discharges are highly influenced by natural dispersion and dilution processes, the extent of exposure is most influenced by the volume of the release. Consequently, the planned discharges are expected to result in a limited environmental impact, and the consequence level was determined as Incidental (6).			
Potential chemical toxicity As described above, these discharges are expected to result in temporary reductions in water quality within the immediate surroundings of the release location. The extent of this water quality reduction is limited to around the subsea wells and drill centres. The particular values and sensitivities identified as having the potential to be exposed to these discharges are: • ancient coastline at 125 m depth contour (KEF) • continental slope demersal fish communities (KEF) • commercial fisheries. Although these KEFs have been identified as having the potential to be exposed, as described in Section 4.3.5, the benthic habitats within the OA is known to comprise soft sediment infauna communities that are widespread and homogenous in the region. ROV footage of WST-3 confirms the drill centre is located in a soft-sediment location absent of sessile benthic organisms (Figure 4-17). ROV footage in the area of IAG-1, which is located at ~119 m depth, also confirms that the drill centre is located on soft sediments and sessile benthic organisms have not been noted (Figure 4-16]). Given that biologically important habitats tend to be found in areas of rocky escarpment rather than soft sediments (Ref. 28), exposure to habitats comprising high levels of diversity are not			

expected. The *North-West Marine Bioregional Plan* (Ref. 28) does not identify toxicity or chemical pollution/contaminants as a key threat to the continental slope demersal fish communities or ancient coastline at 125 m depth contour KEF. Given the rapid dilution and dispersion conditions, low bioaccumulation potential and the high biodegradability of the control fluids, and intermittent frequency of discharges, bioaccumulation in the receiving environment and sublethal impacts are expected to be limited. Consequently, the release of subsea discharges are expected to result in a limited environmental impact, and the consequence level was determined as Incidental (6).		
ALARP decision context justification		
Subsurface operational discharges associated with the operation of subsea infrastructure are commonplace and well-practiced within the industry. The control measures to manage the risk associated with these planned discharges are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL During stakeholder consultation, no objections or claims were raised regarding planned discharges from subsea operations arising from the activity. The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.		
Good practice control measures and source		
Control measure	**Source**	
Hazardous materials selection process	As part of the hazardous materials selection process, hazardous materials that will be discharged to the environment will undergo a detailed environmental assessment, as per CAPL's *Hazardous Materials Management Procedure* (Ref. 55)	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Given the nature and scale of this activity, and with standard control measures in place, it is considered Remote (5) that this discharge would result in any impact to the ecological function of the particular values and sensitivities present within the OA.	
Risk level	Very low (10)	
Determination of acceptability		
Principles of ESD	The potential impacts and risks associated with this aspect is limited to a short-term direct reduction in water quality in a localised area, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	This CAPL environmental performance standard / procedure was deemed relevant for this aspect: • *Hazardous Materials Management Procedure* (Ref. 55).	
External context	During stakeholder consultation, no objections or claims were raised regarding planned discharges from subsea operations arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In	

	addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to marine habitats and fauna from subsea discharges during petroleum activities	**Hazardous materials selection process** Subsea fluids planned for discharge are subject to the hazardous materials selection process as per the CAPL *Hazardous Materials Management Procedure*	Hazardous materials selection process assessment records (or similar)

6.1.3 Unplanned release—Loss of containment

Source
Activities identified as having the potential to result in a minor loss of containment (LOC) event: • start-up and operations of the hydrocarbon system. Based on the activities described in this EP, the following potential minor LOC scenarios were identified: • corrosion or mechanical failure/damage of flowlines resulting in a loss of various fluids including condensate, control fluids, or MEG[1] • corrosion or mechanical failure/damage of subsea valves, resulting in loss of control fluids[2] • corrosion or mechanical failure/damage of onshore trunkline resulting in loss of condensate[3]. *[1] A flowline loss of containment can result in the release of production fluids (gas and condensate): <58 m^3 of condensate over 5.1 days from a leak, or ~58 m^3 of condensate over 2 hours from a full-bore rupture (FBR) (Ref. 79). A flowline release (MEG flowline or umbilical) can result in smaller releases of MEG, process chemicals, and control fluids, estimated to range from 1–25 m^3, based on the volumes contained in the flowlines.* *[2] A valve loss of containment can result in control fluids leaking from the hydrocarbon system, resulting in ~1 m^3 per day. Based on the input from operations and engineering personnel, the approximate worst-case duration is conservatively estimated at ~90 days.* *[3] A trunkline loss of containment (onshore) can result in the release of gas and condensate, ~<100 m^3. This volume is estimated based on flow and pressure at the onshore location, and the time taken to isolate the inventory.*

Potential impacts and risks

Impacts	C	Risks	C
N/A	-	Unplanned release of hazardous material to the marine environment may result in: • indirect impacts to fauna arising from chemical toxicity	6
		Unplanned release of hazardous material to the onshore environment may result in: • soil and groundwater contamination	6

Consequence evaluation
Potential chemical toxicity The largest offshore LOC event is estimated to be ~58 m^3 of condensate, and therefore this scenario has been used as the basis of this consequence evaluation. A subsea release of ~58 m^3 of condensate would be expected to temporarily change the water quality within the immediate vicinity of the release.

Previous modelling conducted for the Gorgon Project, for a 50 m^3 subsea release of condensate, predicted that the extent of exposure to the condensate was limited to within 22 m of the release location (Ref. 80). Given the depths and environmental conditions of the Gorgon field, it is expected that a similar extent of exposure would occur for a subsea release within the Wheatstone OA.

The values and sensitivities within the OA with the potential to be exposed to decreased water quality from an unplanned subsea LOC release include:

- Humpback Whale (migration)
- Pygmy Blue Whale (migration, distribution)
- Flatback Turtle (interesting buffer, nesting)
- Hawksbill Turtle (interesting buffer)
- Whale Shark (foraging)
- ancient coastline at 125 m depth contour (KEF)
- continental slope demersal fish communities (KEF)
- commercial fisheries.

Based on the nature of these unplanned releases, which are non-continuous and expected to occur in a location where no specific sedentary behaviours for values and sensitivities have been identified, the extent and severity of any potential impact is expected to be limited.

Given the nature of unplanned releases covered under this EP and the transient nature of identified values and sensitivities, fauna would need to pass directly through the plume almost immediately upon release to be impacted.

Any potential impact from such an event is expected to be limited, thus the consequence level was determined as Incidental (6).

Soil and groundwater contamination

The largest onshore LOC event is estimated to be ~100 m^3 of condensate, and therefore this scenario has been used as the basis of this consequence evaluation.

Given the onshore section of trunkline is covered by soil, the spatial extent of an onshore release would be limited to a relatively confined area around the trunkline, with most of the fluids likely to soak into the surrounding soil. Based upon Grimaz et al. (Ref. 81) it is anticipated that a release of 100 m^3 could result in up to ~1 m penetration depth into the soil profile. As such, no exposure to groundwater is expected to occur from minor LOC events.

No specific values or sensitivities (e.g., TECs) are present within the onshore OA.

Given the limited spatial exposure, buried trunkline, and the previously disturbed nature of the receiving environment, any potential impact from an onshore minor LOC event are expected to the limited. As such, the consequence level was determined as Incidental (6).

ALARP decision context justification

The operation of hydrocarbon systems is commonplace and well-practiced within the industry. The control measures to manage the risk associated with these unplanned discharges are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL.

During stakeholder consultation, no objections or claims were raised regarding planned discharges from subsea operations arising from the activity.

The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
Inspection and Monitoring Plan (IM Plan)	Inspections provide assurance that assets are in good condition and proactively identify maintenance or repair activities that may be required. The type and frequency of inspections of the hydrocarbon system will be undertaken in accordance with the *Wheatstone Upstream Subsea System Inspection and Monitoring Plan* (Ref. 22) and *Wheatstone Upstream Trunkline System Inspection and Monitoring Plan* (Ref. 23).

	The IM Plans also require that hydrocarbon system process monitoring (pressure, temperature and flow rates), fluid composition monitoring, and corrosion monitoring are undertaken. Inspection and monitoring results are assessed against acceptance criteria to allow early identification and management of potential anomalies through engineering assessment, maintenance, and repairs to ensure the integrity of the hydrocarbon system and prevent a loss of containment. Inspections are tracked via the computerised maintenance management system (CMMS).	
Isolation valve function and verification tests	As mentioned in Sections 3.2.1.4, 3.2.2.3, and 3.3.2.9, the hydrocarbon system includes isolation valves to shut in inventories in the event of a release. This isolation can reduce the potential volumes of fluids released to the environment. If a spill is detected from the hydrocarbon system, these valves can be operated to potentially limit the volume released, as actioned through Source Control Procedures. Verification of the performance of these valves, including emergency isolation and shut down functionality, will be tested before introducing hydrocarbons.	
Source control	Source control is part of the first actions taken to minimise the volume of fluids released and therefore reduce potential impacts and risks to the environment. CAPL has developed emergency operating procedures (EOPs) (Section 8.3.2.8) that provides guidance to operations personnel to detect, isolate, and stabilise non-routine events such as trunkline/flowline loss of containment scenarios. Source control is the initial action for spills and will be undertaken in accordance with documented EOPs including *Operability, Reliability, Maintainability – 1060 Platform – Response To Emergency Shutdown (ESD1)* (Ref. 76), which outlines the procedure for isolating and shutting down Wheatstone and Iago or third-party systems if required to manage the risk.	
Wheatstone Downstream Emergency Response Plan (ERP)	Plans, processes, and procedures outline activities to control and respond to minor operational spills and are essential in ensuring a coordinated, consistent approach. For onshore spills, because the trunkline is buried or below ground for most of the terrestrial route, response activities will be limited, and undertaken in accordance with the *Wheatstone Downstream Emergency Response Plan* (Ref. 82).	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	The likelihood that a minor LOC event results in an Incidental (6) consequence was determined to be Unlikely (4). With the control measures in place, it was considered unlikely that a minor LOC event associated with this activity would occur, and even more unlikely that such an event would impact any of the identified values and sensitivities.	
Risk level	Very low (9)	
Determination of acceptability		
Principles of ESD	The risks associated with this aspect are expected to have a limited environmental impact, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6).	

	Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • IM Plans (Ref. 22; Ref. 23) • EOPs (Ref. 76) • Wheatstone Downstream ERP (Ref. 82).	
External context	During stakeholder consultation, no objections or claims were raised regarding LOC management arising from the activity	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**IM Plan** Inspection and maintenance will include, but not be limited to: • a post-start-up inspection of the subsea hydrocarbon system within 24 months of start-up • inspections of the onshore PL99 pipeline licence area in accordance with the IM Plan	CMMS records confirm • a post-start-up inspection of the subsea hydrocarbon system within 24 months of start-up • inspections of the onshore PL99 pipeline licence area are undertaken in accordance with the IM Plan
	IM Plan Monitoring of hydrocarbon system pressure, temperature, flow rates and fluid composition against acceptable criteria and limits will be aligned with the IM Plan	Records confirm monitoring of hydrocarbon system pressure, temperature, flow rates and fluid composition against acceptable criteria and limits are aligned with the IM Plan
	Isolation valve function and verification tests Isolation valves are tested to verify valve integrity and functionality prior to the introduction of hydrocarbons.	Integrity test records for the isolation valves confirm testing and valve functionality prior to the introduction of hydrocarbons
	Source control The isolation steps of the source control / isolation procedures implemented within 30 mins if a spill is detected from the hydrocarbon system	Records demonstrate relevant isolation components of the source control procedures are implemented if a spill is detected from the hydrocarbon system.
	Wheatstone Downstream ERP Onshore trunkline spill response implemented as outlined in Wheatstone Downstream ERP if a spill is detected from the hydrocarbon system	Records confirm onshore trunkline spill response is undertaken in accordance with Wheatstone Downstream ERP

6.2 Platform

6.2.1 Physical presence—Other marine users

Source			
Activities identified as having the potential to result in an interaction with other marine users are: • permanent presence of the platform within the OA.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	–	Unplanned interactions with other marine uses may result in: • disruption to commercial shipping and fishing vessels	6
Consequence evaluation			
The spatial extent of the platform and safety exclusion zone equates to ~0.79 km^2 (500 m exclusion zone). As identified Section 4.4.1, there are two State commercial fisheries (Pilbara Line Fishery, Pilbara Trap Managed Fishery) that have recent fishing effort that overlaps with the OA. The extent to which the platform exclusion zone overlaps the management areas for these fisheries is estimated to be <1%. As identified in Section 4.4.1, one Commonwealth managed commercial trawl fishery (North West Slope Trawl Fishery) has a management area that overlaps with the OA. Fishing activity within the Commonwealth trawl fisheries is restricted to waters >200 m water depth. The platform, and its exclusion area is in water depths ~70 m. Therefore, the presence of the platform is not expected to cause any disruption to the North West Slope Trawl Fishery vessels or activities. The installation of the platform was completed in 2015 and to date no incidences of commercial fishing activities interacting with the infrastructure have been recorded. Consequently, the continued presence of the platform is not expected to result in a significant impact to commercial operations (via loss of catches). Any deviation required by these vessels around the platform is not expected to impact on the functions, interests, or activities of other marine users (as confirmed by stakeholder consultation records). The platform is located outside major shipping lanes and commercial marine traffic density around the platform is low (Section 4.4.2) indicating that it is not expected to affect major shipping channels or commercial shipping operators. Any deviation required by these vessels is not expected to impact on the functions, interests, or activities of other marine users (as confirmed by stakeholder consultation records). In summary, the physical presence of the platform is not expected to cause significant impacts to other marine users, and the risks are considered limited with potential consequences. Therefore, CAPL has ranked the potential consequence to other marine users from physical presence as Incidental (6).			
ALARP decision context justification			
The operation of offshore facilities is commonplace and well-practised nationally and internationally. The control measures to manage the risks associated with unplanned interactions with other marine users are well defined and understood by the industry. During stakeholder consultation, no objections or claims were raised regarding disturbance/disruption to other marine users arising from the petroleum activity. The risks arising from the physical presence of subsea infrastructure and support vessels to other marine users are considered lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.			

Good practice control measures and source

Control measure	Source
CMMS	Ongoing maintenance of the platform navigation equipment ensures equipment is operational and provides situational awareness of

	maritime traffic movements, thereby reducing the risk of interference with other marine users. The equipment standards of performance are included in the Computerised Maintenance Management System (CMMS). Maintenance activities are managed through the CMMS (described in Section 8.3.2.3), which is used as the main asset and inventory management system within CAPL for performing and tracking maintenance activities.	
Stakeholder engagement	Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information. Communicating the activity details, location, and presence of vessels to other marine users ensures they are informed and aware, thereby reducing the risk of unplanned interactions.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	The platform is located outside major shipping lanes and high density shipping areas, and in an area of limited commercial fishing activity. The installation of the platform was completed in 2015 and to date no incidences of interaction with the infrastructure has been recorded. As such, CAPL consider that the likelihood of the consequence occurring is Unlikely (4).	
Risk level	Very low (9)	
Determination of Acceptability		
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing incidental disruption to other marine users, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with other marine users arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to other marine users from petroleum activities	**CMMS** Platform radar, navigational lighting and audio navigational equipment is maintained in accordance with the CMMS.	CMMS records show platform radar, navigational lighting and audio navigational equipment is maintained

	Stakeholder engagement Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information	Stakeholder consultation records

6.2.2 Air emissions

Air emissions from the platform will include criteria pollutants (e.g., oxides of nitrogen, carbon monoxide), air toxics (e.g., benzene, toluene, xylenes) and greenhouse gases (primarily carbon dioxide).

Air emissions will occur at the platform predominantly from gas turbine exhausts and flaring (described in Section 3.3). The gas turbines are used to drive the electricity generators and the natural gas export compressors. The flare is used to safely dispose small flows of waste gas and to safely depressurise the facility in the event of a process upset. The compressors have not been required throughout the early years of operation however will now be progressively ramped up. Full compression is estimated to occur from around 2029.

Air emissions are associated with release from flares (HP and LP), gas turbine generator exhaust (x3), compressor turbine exhaust (x2), and fugitive emissions. The emissions profile will vary throughout the operational life of the facility dependant primarily upon the amount of compression required, and flaring rates.

Without compression a significant proportion of the natural resource would remain undeveloped. CAPL have identified that at the current time there are no reasonably practicable alternatives to compression available for implementation at the platform.

As described in Section 3.3.2.3, two flares (HP and LP) are used on the platform. The HP flare is used for upset, relief, and blowdown loads, and is therefore considered a safety critical element for platform operations. Blowdown flaring throughout operations to date has been a rare occurrence, while hydrate inhibition of flowlines using MEG has proven an effective management measure, further reducing the need to depressurise via the HP flare. At the current time, there is no reasonably practicable alternative to the use of the HP flare from a safety and integrity perspective. However, even if it were possible, this action would not be expected to result in a material reduction of impacts associated with air quality or greenhouse gas emissions.

The LP flare is used on a continuous basis for waste gas streams. LP flaring is inherent to the platform design associated with vessel blanketing and the induced gas flotation where fuel gas is applied for secondary produced water treatment. Alternative off-gas recovery systems to eliminate LP flaring were considered during FEED (Ref. 253). However, for the alternative designs involving off-gas recovery, the environmental benefit gained from a reduction in LP flaring emissions would be counteracted by increased power generation emissions associated with running the gas recovery compressors. Additionally, increased safety risks are associated with potential leak sources and potential exposure of the waste gas stream to personnel. Therefore, the use of an off-gas system is not considered to be a practicable alternative. The environmental benefit of a reduction in LP flaring would have negligible effects on air quality and greenhouse gas emissions.

An updated forecast of air emissions (i.e., key criteria pollutants, air toxics, and greenhouse gases) is shown in Table 6-2 for the free flow (based on historical reported actuals), early compression, and full compression operating scenarios, while Table 6-3 summarises approximate emissions by point source type.

Table 6-2: Summary of estimated annual platform air emissions

Emission	Units	Free-Flow	Early compression	Full compression
Key criteria pollutants and air toxics				
Carbon monoxide (CO)	tpa	890	445	453
Nitrogen oxides (NO_x)	tpa	163	505	989
Particulate matter <10 microns (PM_{10})	tpa	26	8	9
Particulate matter <2.5 microns ($PM_{2.5}$)	tpa	26	8	9
Volatile organic compounds (VOCs)	tpa	1,533	803	512
Sulfur dioxide (SO_2)	tpa	0.3	0.2	1.2
Greenhouse gases				
Carbon dioxide (CO_2)	tpa	332,183	216,374	386,971
Methane (CH_4)	tpa	413	162	122
Nitrous oxide (N_2O)	tpa	10	4	3
Carbon dioxide equivalents	t CO_2e/yr	**345,623**	**221,664**	**390,950**

Table 6-3: Summary of estimated annual greenhouse gas emissions by point source type (t CO_2e/yr)

Emission (t CO_2e)	Free Flow	Early Compression	Full compression
Flaring	289,000	109,000	42,000
Compressor Turbines	—	56,000	286,000
Gas Turbine Generators	52,000	52,000	58,000
Other emissions	5,000	5,000	5,000
Total	**346,000**	**222,000**	**391,000**

6.2.2.1 Guidelines—criteria pollutants

When considering the management of criteria pollutant air emissions, the National Environment Protection (Ambient Air Quality) Measure (NEPM AAQ) establishes quantifiable standards and goals against which ambient air quality can be assessed. The NEPM AAQ is aimed at achieving ambient air quality that allows for the adequate protection of human health and wellbeing. However, in the absence of other standards relevant to the air shed surrounding the platform, it is considered appropriate to use these standards as the criteria for comparison in this air quality assessment.

6.2.2.2 Greenhouse gas

The Commonwealth government supports the implementation of mature technologies, including LNG, to support Australia’s low emissions transformation (Ref. 263). The current Commonwealth government views gas as part of the

Commonwealth government's plan to reduce emissions without imposing new costs on households, while at the same time creating jobs, growing businesses and the economy (Ref. 264).

There are no specific guidelines for greenhouse gas emissions in Australia from petroleum activities.

Scope 1 greenhouse gas emissions from the platform, once the compression turbines are fully operational, are anticipated to average ~391,000 t CO2-e per year. This represents <0.5% of the greenhouse gas emissions from Western Australia, and <0.1% of national Australian emissions (when compared to 2019 inventory) (Ref. 265). Australia is currently (based on 2018 data) estimated at contributing ~1.3% of global greenhouse gas emissions (Ref. 266). If the Wheatstone platform emissions are <0.1% of Australia's emissions which contribute ~1.3% of global greenhouse gas emissions, then the Wheatstone platform contributes <0.000013% to the global carbon balance, which is a *de minimis* amount.

There are no Scope 2 greenhouse gas emissions associated with platform operations; and as such, Scope 2 emissions are not discussed further.

The Wheatstone Project (including platform operations) was referred, pursuant to the EPBC Act, on 16 September 2008. The Minister's delegate set the assessment approach as assessment by environmental impact statement. Chapter 3 and Chapter 4 of the *Draft Environmental Impact Statement/ Environmental Review and Management Proposed Wheatstone Project* (Ref. 26) set out the environmental impact assessment of greenhouse gas emissions. In that assessment it was estimated that the Wheatstone Project would emit approximately 0.45 Mtpa of greenhouse gas for the offshore component (including the platform). The estimated annual emissions for the Wheatstone platform (0.391 Mtpa) are within the amount of greenhouse gas emissions for offshore assessed under the EPBC Act. The Wheatstone Project was approved by the then Minister for Sustainability, Environment, Water, Population and Communities on 22 September 2011. The approval has effect until 31 December 2060.

Anthropogenic climate change impacts cannot be directly attributed to any one development, as they are the result of the net accumulation of global greenhouse gases (emissions minus sinks) in the atmosphere since the industrial revolution. CAPL has not been able to identify any peer reviewed literature that demonstrates a causative link between a single source of greenhouse gas emissions, such as the platform, and localised environmental harm. Any assessment of direct impacts cannot currently be based on any generally accepted scientific methodology at the present time.

Given greenhouse gas emission from the platform are a *de minimis* amount, they are not expected to directly or indirectly cause local, regional, or global environmental impacts or risks in either the short or long term. Emissions from the Wheatstone platform are <0.1% of national Australian emissions and contributes <0.000013% to the global carbon balance. Although this presents a reasonably foreseeable increase in the contribution to increased atmospheric carbon dioxide, such an increase is *de minimis*.

Greenhouse gas emissions are within levels previously assessed and approved pursuant to the EPBC Act. While all global greenhouse gas emissions contribute to the global carbon budget, there is no causal link between the *de minimis* greenhouse gas emissions from the Wheatstone platform (which are well within the carbon budget of Australia) and either localised environmental impacts, or climate change that then impacts protected matters under the EPBC Act. As the Working Group I contribution to the newly released Sixth Assessment Report of the Intergovernmental Panel on Climate Change acknowledges, "[c]limate change is a global phenomenon, but manifests differently in different regions" (Ref. 268). Moreover, the Summary for Policymakers to the same report states that "[h]istorical cumulative CO_2 emissions determine to a large degree warming to date, while future emissions cause future additional warming" (Ref. 269). Thus, future emissions are relevant to remaining carbon budgets, which vary based on emissions scenarios, and "indicate[] how much CO_2 could still be emitted while keeping warming below a specific temperature level" (Ref. 269).

Consequently, environmental impacts and risks from greenhouse gas emissions from the platform are non-credible. As such, impacts of greenhouse gas emissions has not been considered further.

CAPL acknowledge that the Wheatstone Project (i.e., the facility as a whole, including the platform) is required to report greenhouse gas emissions under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). From July 2016 emissions have been subject to a baseline in accordance with the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*. Greenhouse gas emissions are measured as tonnes of carbon dioxide equivalence (CO_2-e).

6.2.2.3 Risk assessment

Source			
Activities identified as having the potential to result in air emissions from the platform are: • combustion of natural gas as a fuel source • flaring.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Air emissions may result in: • localised and temporary reduction in air quality	6	N/A	–
Consequence evaluation			
Localised and temporary reduction in air quality Impacts from air emissions (criteria pollutants – including oxides of nitrogen, carbon monoxide and particulate matter and air toxics – including benzene) depend on discharge volume, frequency, duration of exposure, as well as the location and nature of the receiving environment. Air quality changes associated with emissions of criteria pollutants and air toxics are limited to the air shed local to the platform. Reservoir characterisation of Wheatstone fields indicates minimal levels of hydrogen sulfide in the reservoir fluids (<2 ppm) (Ref. 20). As such, combustion of the natural gas at the platform results in correspondingly low-level emissions of sulfur dioxide. For this reason, potential emissions of sulfur dioxide from the platform are not considered significant and not evaluated further. Air emissions dispersion modelling was performed based on system design to quantify and assess impacts from air emissions from the platform. Model assumptions and have been reviewed and modelling remains a conservative approach for the updated emissions forecast, and appropriate for comparison of the predicted emissions against guidelines. Modelling was conducted using a Gaussian, steady-state plume model (Ref. 254), using 1 year of meteorological data to capture most weather conditions and extended to an approximate grid of 25 km by 25 km surrounding the platform. Nitrogen dioxide, carbon monoxide, particulate matter and VOC were modelled using conservative emission rates in a screening approach. Nitrogen dioxide emissions from the facility were modelled on the assumption that all NO_x are present as NO_2. This assumption is conservative as the conversion of NO to NO_2 will be limited by the available O_3,			

allowing only a fraction of the available NO to react (~15–20%). VOC emissions modelling outputs can be evaluated against relevant NEPM standards by considering all emitted VOC is present as either benzene, toluene or xylene. This is a highly conservative approach given these constituents account for less than 1% of VOC emissions as reported. Modelling predicted maximum ambient concentrations to be substantially below the NEPM AAQ standards. Results included: • a maximum ambient NO_2 concentration of 0.02 ppm (compared to the NEPM 1 hour standard of 0.12 ppm) • a maximum ambient CO concentration of 0.01 ppm (compared to the NEPM 8-hour standard of 9 ppm) • a maximum ambient PM_{10} concentration of 0.14 µg/m^3 (compared to the NEPM 24-hr standard of 50 µg/m^3). While not modelled similar results would be expected for $PM_{2.5}$ (compared to the NEPM 24-hour standard of 25 µg/m^3). • a maximum ambient VOC concentration of 0.16 ppb (compared with 3 ppb, 100 ppb and 200 ppb NEPM annual standards for benzene, toluene and xylene respectively) Modelling demonstrates the concentrations of oxides of nitrogen, carbon monoxide, particulate matter and VOC's are predicted to be well below NEPM AAQ standards indicating there will be no significant degradation of ambient air quality. Updated emissions forecast data affirms emissions estimates for early and late compression will be similar in magnitude to those modelled prior to operations. The potential consequence of the air emissions from the platform causing air quality changes is therefore ranked as Incidental (6).	
ALARP decision context justification	
Offshore facility operations and subsequent air emissions arising from these facilities are commonplace both internationally and nationally. The control measures to manage the risk associated with air emissions are well defined and are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding air emissions arising from the activity. The impacts and risks arising from air emissions constitute lower-order impacts (Table 5-3). As such, CAPL applied ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
Energy efficient design	During the design phase for the Wheatstone Project, energy efficient design features were incorporated to minimise power demand and in turn air emissions. Specifically, some of the equipment installed included the waste heat recovery units (WHRUs), high integrity valves and flanges, seawater heat exchange and lift pump configuration, aero derivative turbines, variable compression modes, condensate export pumps with variable speed drive.
CMMS	To ensure that all energy efficient features are operating appropriately, preventative maintenance regimes have been developed and incorporated into the CMMS. Maintenance activities are managed through CMMS which is used as the main asset and inventory management system within CAPL for performing and tracking maintenance activities.
Air emissions monitoring	The Platform Air Emissions Monitoring Program (Section 8.4.1.2) is designed to meet emissions reporting requirements. Gas compressor turbines, power generation turbines, diesel system, LP flared gas and HP flared gas, and pilot gas and purge gas are monitored to inform emissions reporting and management.
Flare monitoring and minimisation	The *Wheatstone Platform Flare Minimisation and Optimisation Plan* (Ref. 83) includes a flare management section involving setting of performance standards/targets for flaring and regular monitoring of performance against these standards to ensure that flaring volumes are minimised as far as reasonably practicable.

Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	N/A	
Risk level	N/A	
Determination of acceptability		
Principles of ESD	The impact associated with this aspect is limited to a direct reduction in air quality for a localised area, which is not considered to have the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant to this aspect include: • *National Environment Protection (Ambient Air Quality) Measure* • National Pollutant Inventory (Ref. 267).	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • Wheatstone Platform Flare Minimisation and Optimisation Plan (Ref. 83).	
External context	During stakeholder consultation, no objections or claims were raised regarding air emissions arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to air quality from petroleum activities	**Energy efficient design** The energy efficient design features (including the WHRUs, valves and flanges, seawater lift pumps, aero derivative turbines, condensate export pumps) are installed, tested and commissioned according to the relevant Commissioning Test Procedures prior to hydrocarbon production	Records show installation is according to Commissioning Test Procedures
	CMMS The compressors, power generators, flaring system, WHRUs and seawater lift pumps are maintained in accordance with CMMS	CMMS records show maintenance of compressors, power generators, flaring system, WHRUs and seawater lift pumps
	Air emissions monitoring Platform Air Emissions Monitoring Program implemented as per Section 8.4.1.2	Records confirm Air Emissions Monitoring Program is implemented

	Flare monitoring and minimisation Flare monitoring and minimisation program implemented.	Records confirm Flare Monitoring and Minimisation Program is implemented

6.2.3 Light emissions

Source			
Activities identified as having the potential to result in light emissions are: • navigation and operational lighting from the platform within the OA.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Light emissions may result in: • localised and temporary change in ambient light.	6	A change in ambient light may result in: • attractant for light-sensitive species and in turn affect predator-prey dynamics	6
Consequence evaluation			

Localised and temporary change in ambient light

The platform lighting system includes general and emergency lighting to satisfy necessary safety, visibility, and task illumination requirements. Additionally, the flare tip (~150 m above sea level) includes a small, constantly lit LP flare (Section 3.3.2.3). The HP flare is for upset conditions, and given it's non continuous and infrequent use is not discussed further in this evaluation.

Monitoring undertaken by Woodside (Ref. 84) indicates that light density from navigational lighting on a MODU attenuated to below 1.0 lux and 0.03 lux at distances of ~300 m and ~1.4 km, respectively. Light densities of 1.0 lux and 0.03 lux are comparable to natural light densities experienced during deep twilight and during a quarter moon.

Based on Woodside (Ref. 84), CAPL expects that the platform will result in temporary changes to ambient light emissions no larger than a radius of ~1.4 km. Operational and navigational lighting is expected to be similar in comparison to a MODU, therefore referencing this modelling is considered an appropriate approach for this consequence evaluation.

Given the limited extent of the change arising from platform lighting, the impacts associated with a direct change in ambient light levels was determined to be Incidental (6).

Acting as an attractant to light-sensitive species and in turn affecting predator–prey dynamics

There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding, or breeding behaviours of cetaceans. Cetaceans predominantly use acoustic senses rather than visual sources to monitor their environment (Ref. 85), so light is not considered to be a significant factor in cetacean behaviour or survival.

Light-sensitive fauna (including reptiles, birds and fish) are the species most at risk from this aspect and thus are the focus of this evaluation. As identified in Section 4, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. Several BIAs also overlap with the OA, including:

- Flatback Turtle, Hawksbill Turtle (interesting buffer)
- Whale Shark (foraging)
- Lesser Crested Tern, Wedge-tailed Shearwater (breeding).

Studies conducted between 1992 and 2002 in the North Sea confirmed that artificial light was the reason that birds were attracted to and accumulated around illuminated offshore infrastructure (Ref. 86) and that lighting can attract birds from large catchment areas (Ref. 87). These studies indicate that migratory birds are attracted to lights from offshore platforms when travelling within a radius of 5 km from the light source, but their migratory paths are unaffected outside this zone (Ref. 88). The *National Light Pollution Guidelines* (Ref. 10) indicate that a 20 km buffer or exposure area can provide a general precautionary light impact limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15–18 km (Ref. 89; Ref. 90) and fledgling seabirds grounded in response to artificial light 15 km away (Ref. 91). At its closest, the

OA is located ~50 km from the coast (Montebello Islands). As light emissions from the platform are expected to result in a change to ambient conditions up to a maximum of ~1.4 km from the vessel, no coastal areas (and therefore turtle hatchlings or fledgling seabirds) are expected to be exposed.

The *Recovery Plan for Marine Turtles in Australia* (Ref. 94) identifies light emissions as a key threat because it can disrupt critical behaviours. However, the Recovery Plan also notes that critical behaviours are focused on nesting (therefore coastal areas), as well as disrupting hatchling orientation and sea-finding behaviours of hatchlings. Given the platform is located offshore, light emissions would not affect critical behaviours as described in the Recovery Plan. In addition, a study by Whittock et. al. (Ref. 92) reported that Flatback Turtles preference habitats within proximity of the coast and at relatively shallow depths during the internesting period. Specifically, during the study, a maximum distance from the nearest coast and maximum water depth of 27.8 km and <44 m respectively were recorded; and mean maximum distance away from the nearest coast and mean water depth being less than 6.1 km and <10 m respectively (Ref. 92). Given that the platform is located ~50 km from the nearest coast (Montebello Island), even though the Flatback Turtle internesting area may be exposed to changes in ambient light levels, due to the distance offshore and water depths (>70 m) it is very unlikely that this exposure would lead to any significant impact.

Anthropogenic disturbance and artificial lighting is identified as a threat within the *Wildlife Conservation Plan for Migratory Shorebirds* (Ref. 93). However, only a small number of threatened or migratory bird species would be expected to be present in this area. Light emissions that attract a small number of individual seabirds

Because light emissions have the potential to cause temporary impacts to a small number of protected species over the course of the activity, CAPL has ranked the consequence associated this impact as Incidental (6).

ALARP decision context justification

Offshore platform operations and subsequent light emissions are commonplace in offshore environments nationally and internationally.

During stakeholder consultation, no objections or claims were raised regarding light emissions arising from the activity.

The impacts and risks associated with light emissions are well understood, and considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
None identified	No controls have been applied for these impacts and risks as light management is a lower-order impact and risk; no industry standard controls are required for offshore light emissions where minimal impacts and risks are present.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	The platform is located in Commonwealth waters, ~50 km from nearest coast (Montebello Islands). The extent of exposure from measurable changes to ambient light is estimated to be limited to an area within ~1.4 km from the platform. As such the likelihood of exposing sensitive receptors resulting in the identified consequence was considered Remote (5).
Risk level	Very low (10)

Determination of acceptability

Principles of ESD	The impacts and risks associated with this aspect is disruption to light-sensitive species behaviour, which given the location, is not considered as having the potential to affect biological diversity and ecological integrity.

	The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered for this aspect include: • *National Light Pollution Guidelines* (Ref. 10) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94) • *Wildlife Conservation Plan for Migratory Shorebirds* (Ref. 93).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding light emissions arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measures**	**Measurement criteria**
N/A	N/A	N/A

6.2.4 Underwater sound

Source			
Activities identified as having the potential to result in underwater sound are: • start-up and operation of the platform. These activities result in the emission of continuous sound: **Continuous sound** The platform topsides generate airborne sound emissions, which may result in changes to ambient underwater sound levels. As machinery is mounted on the deck of the platform, most sound is transmitted to the marine environment from the air or radiated into the water via jacket legs and risers. During detailed design for the topsides, several studies and investigations were undertaken and limits for individual items of equipment have been set at a maximum above-sea noise level no greater than 80 dB(A) @1 m (general equipment limit). Sound generated by the valves and transmitted into the HP flare header can exceed 100 dB(A) @1 m externally. A study by Gales (Ref. 101) demonstrated that the strongest noise levels from platforms during production operations are of relatively low frequency (<100 Hz, mostly between 4-38 Hz), with sound levels of 110–130 dB re 1 µPa @100 m (Ref. 101). However, monitoring programs have shown that underwater sound from platforms is usually very low or not detectable (Ref. 102).			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Airborne sound emissions may result in: • localised and temporary change in ambient underwater sound.	6	N/A	-
Consequence evaluation			
Ambient underwater sound levels typically range from 45-60 dB re 1 µPa[3] in quiet regions (very calm, low wind seas and light shipping) to 80-100 dB re 1 µPa for more typical conditions, and			

[3] *Measure of underwater noise in terms of sound pressure. As dB is a relative measure, it must be referenced to a standard 'reference intensity', in this case 1 micro-Pascal (1 µPa), which is the standard reference that is used.*

>120 dB re 1 µPa during periods of high rain, strong winds and biological choruses from vocalising species (Ref. 103). As indicated by Gales (Ref. 101), underwater sound resulting from platform operations (110–130 dB re 1 µPa @100 m) is expected to be limited, and within typical ambient underwater sound levels. As such, airborne sound emissions associated with platform operations are expected to result in limited environmental impacts and consequently have been ranked as Incidental (6). Further to this, as sound emissions arising from platform operations are expected to be minimal and well within ambient underwater sound levels throughout all operations, no credible impacts to marine fauna have been identified or considered further.
ALARP decision context justification
Noise emissions associated with the operation of facilities are commonplace in offshore environments nationally and internationally. During stakeholder consultation, no objections or claims were raised regarding noise emissions arising from the activity. The impacts associated with noise emissions are considered lower-order impacts in accordance with Table 5-3, and impacts to marine fauna from these emissions are not expected. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
None identified	No controls have been applied for these impacts as airborne sound management is a lower-order impact; no industry standard controls are required for offshore sound emissions where minimal impacts are present.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	N/A
Risk level	N/A

Determination of acceptability

Principles of ESD	The impacts associated with this aspect are limited to localised, incidental changes in ambient underwater sound. As such, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	No legislation or other requirements were deemed relevant for above-surface noise emissions arising from platform operations.
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity.
Defined acceptable level	These impacts are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
N/A	N/A	N/A

6.2.5 Planned discharges—Produced water

Operation of the PW system is described in Section 3.3.2.6, and generates the environmental aspect of planned discharges of PW. Upon the introduction of well fluids into the hydrocarbon system, PW is physically separated from the well fluids at the platform, treated and discharged as per Section 3.3.2.6.

PW may contain various constituents such as metals, petroleum hydrocarbons (e.g., TPH, BTEX/MAH and PAH [predominantly naphthalene]), glycols (e.g., MEG and TEG), phenols, organic acids, chlorine, NORMS, and residual process chemicals. Drilling completion fluid constituents may also be present during well clean-ups. During clean-up, MEG volumes discharged from the platform are predicted to be approximately 140–400 m^3 per well, usually discharged over one to eight days, with the discharge predominantly comprising MEG and water, with small concentrations of sodium bromide, filter cake/drilling muds (drilling completion fluids) and constituents in PW discussed above.

Baseline water column and sediment sampling as well as a benthic habitat survey was conducted prior to PW discharge, providing details on the water quality and habitats within the discharge zone (Ref. 29).

PW analysis and modelling, and a comprehensive field verification campaign (Section 6.2.5.2) have shown that dilutions exceed those required to meet environmental quality criteria (EQC) at a boundary 850 m from the platform (i.e., the discharge zone). Water quality samples taken during model verification works did not detect hydrocarbons (TPH and BTEX) at distances >5 m, or phenols at distances >15 m, from the platform. Metal concentrations (above background) were below EQC within ~25 m of the discharge point (Ref. 220).

In practice, the water quality of the PW plume will be evaluated by considering dilutions to the edge of the near field (discussed further in Section 6.2.5.2). The plume will notably be further diluted in the far field prior to reaching the discharge zone boundary.

6.2.5.1 Guidelines

Commonwealth guidance on water quality as directed by ANZG (Ref. 11) have been applied, recognising that waters around the platform are outside any marine protected areas, ~140 km from the mainland, ~70 m water depth, and is also in the vicinity of other oil and gas infrastructure and activities. As such, where available the 95% species protection (PC95) marine criteria[4] has been adopted from ANZG (Ref. 11) as the environmental trigger to assess impacts for a slightly-to-moderately disturbed system and are to be met at the discharge zone boundary.

6.2.5.2 Modelling

PW discharge modelling has been conducted to quantify and assess the extent of the highly buoyant PW discharge plume (including behaviour of dissolved and

[4] In some instances ANZG directs the use of the 99% species protection (PC99) value for slightly to moderately disturbed systems.

particulate constituents), which in turn is used to determine whether ANZG guidelines are met at the discharge zone boundary. Multiple phases of modelling has occurred:

- during the development of the EIS (Ref. 26)
- optimised during FEED (Ref. 172)
- refined in 2016 (Ref. 173)
- additional modelling 2018 (Ref. 218)
- validation of model during 2018/2019 (Ref. 219)

The EIS and FEED phase models were based on CORMIX (near field) and CMS-Flow (far field) while the operational modelling uses CORMIX (near field) and MIKE 3FM (far field). Modelling included various temperature, salinity, and flow rates encompassing the start to end of field life. The results show the size, location of the plume, achieved dilutions, and associated dissolved (represented by TPH) and particulate (represented by mercury) concentrations.

Near field (or CORMIX) modelling predicts dilutions at the edge of the near field region (NFR), and the extent of the NFR. The NFR varies with discharge flow rate, salinity/density, and temperature. These simulations can predict dilution at 850 m when it is within the NFR (i.e., near field extends past 850 m). For cases where the NFR is <850 m, the end-of-near-field dilution applies plus additional far-field dilution (which is not available from CORMIX in any reliable manner). For the range of anticipated flow rates up to the maximum design, and considering median current, modelling predicts the edge of the NFR to fall within 850 m, ranging from ~755 m to ~125 m for flow rates of 10 m^3/h and 265 m^3/h respectively (Ref. 173; Ref. 218). Dilutions are in excess of near-field predictions at the discharge zone boundary. The in-field verification of dilutions undertaken in 2018 and discussed further below, showed the model to be conservative, with measured dilutions exceeding those modelled.

Dilution modelling and in-field verification indicate rapid dilutions occur within relatively close proximity to the discharge point, and hence over a discrete and localised spatial extent. Dilutions in the order of ~1,000 were predicted by CORMIX within ~20 m of the discharge point; while field measurements verified the plume was diluted by ~5,000 at ~30 m from the discharge point (Ref. 219). The large dilutions achieved within a relatively short distance is due to the small size of PW discharge, and the receiving environmental being of relatively energetic flow, with the plume traversing ~45 m to the surface as it rises buoyantly (Ref. 173).

For particulates, modelling shows accumulation is a function of particle size, with larger particle sizes dropping out of the plume faster, within closer proximity to the discharge point, leading to more rapid accumulation rates. For particulates, higher concentrations in sediment may be anticipated to occur closer to the platform. For current and anticipated levels of particulate metals (such as mercury), modelling does not indicate exceedance of ANZG sediment quality criteria. Should levels change beyond those anticipated, modelling indicates ANZG sediment quality criteria can continue to be met with treatment (such as filtration). Ongoing monitoring controls discussed in Section 8.4.1 and further modelling (as required) will enable identification of potential exceedances and allow for adaptive management / contingency actions as per Section 8.4.1.

In-field modelling verification

In November 2018, a comprehensive field campaign (Ref. 219; Ref. 222) was executed to validate that environmental guidelines were being achieved, and to validate model predictions. The campaign involved controlled injection of rhodamine WT (RWT) dye into CW and PW discharges from the platform, in conjunction with intensive in situ measurements of the resulting ‘spiked’ plumes. Field measurements involved sample retrieval and fluorometry directly from the vessel, fluorometry and sample retrieval from an ROV despatched to traverse the plume, and sensor measurements by ocean glider and an unmanned aerial vehicle (AUV) to ascertain marine conditions, map plume geometry, and quantify dilutions associated with the discharge plumes. An acoustic doppler current profiler (ADCP) and temperature string were deployed on a fixed mooring for the duration of the campaign.

The results of the field campaign strongly suggest that typical near and far field methodologies, including the CORMIX approach applied at the approval stage of the Wheatstone Project, conservatively underpredict the PW plume dilution at the 850 m discharge zone boundary of the Wheatstone Platform. This appears to be due to platform-induced turbulence (local flow concentration through the platform and associated turbulence around the base, legs, and structural cross-members) which induces additional mixing in the lee of the platform (Ref. 219). Additional conservatism is introduced into the model when considering the prevailing conditions during the field survey which occurred during a period of ambient stratification, neap tides, and small residual current speeds (which generally reduce dilutions) (Ref. 219; Ref 220).

Summary

Additional scenarios will continue to be modelled when required, as well as modelling verification (e.g., on trigger or during field sampling campaign), using relevant information from sampled fluid composition, field results, and baseline data, to improve the understanding of the behaviour of the PW plume and for future contingency planning.

6.2.5.3 Risk Assessment

Source			
Activities identified as having the potential to result in planned discharges from the platform are: • produced water treatment system.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Planned discharges of produced water may result in: • localised and temporary reduction in water and sediment quality.	4	A change in ambient water or sediment quality may result in: • indirect impacts to fauna arising from chemical toxicity • indirect impacts to marine habitats arising from connectivity or chemical toxicity	5 4
Consequence evaluation			
Localised and temporary reduction in water and sediment quality The spatial extent of water quality changes associated with the PW discharge is expected to be limited to the discharge zone (850 m). At the boundary of the discharge zone, all constituent concentrations are predicted to meet ANZG PC95 guidelines (Ref. 11) or be equivalent to			

reference site concentrations. Within the discharge zone, constituents may be at concentrations above the ANZG guidelines.

The PW plume is dynamic and moving constantly depending on the tides, currents, winds, and internal waves; and the plume largely remains in the upper water column due to the positively buoyant characteristics of the discharge (Ref. 172; Ref. 173). Due to the temporal variability and limited spatial extent of the plume, comparison to EQC derived from ecotoxicological tests typically conducted over 24-96 hours, is likely conservative compared with more representative, shorter environmental exposure durations (Ref. 221; Ref. 260). In terms of the spatial extent for seabed interaction, the modelling predicts the plume may reach the seabed only once substantially diluted and therefore well below ANZG trigger guidelines.

Any particulate fallout from the PW plume leading to accumulation is a function of particle size, with larger particle sizes dropping out of the plume faster, within closer proximity to the discharge point. Modelling does not indicate exceedance of ANZG sediment quality criteria.

Given that the extent of change in ambient water and sediment quality is expected to be within 850 m of the platform, and for the duration of platform operations, CAPL has ranked the consequence as Moderate (4).

Potential impacts to marine fauna and marine habitats

Based on the spatial extent of the water quality changes and potential interaction with the seabed, identified environmental values and sensitivities that may be exposed to PW include the ridgeline benthic habitats, ridgeline fish communities, and migrating or foraging whale sharks or cetaceans (Section 4.3.1). Although there is no evidence to suggest the level of diversity is greater in the platform area than the remaining area of the ridgeline (Ref. 29), the hard substratum habitats at the platform ridgeline are included in this assessment.

Potential impacts to the identified environmental values and sensitivities depend on the nature of the constituents in the PW discharge:

- The aquatic toxicity of MEG is very low; and is on the OSPAR list of substances that are considered to pose little or no risk to the environment once released (PLONOR) and is not expected to result in adverse impacts to habitats or fauna.
- The toxicity of TEG was reviewed by Ballantyne and Snellings (Ref. 231) and was reported to have LC_{50} values at gram per litre concentrations, indicating that the compound is effectively non-toxic by US EPA criteria. This is consistent with the Offshore Chemical Notification Scheme (OCNS) that has assessed TEG via the Chemical Hazard Assessment and Risk Management (CHARM) and assigned the lowest CHARM rating of Gold.
- Dispersed oil can be ingested by marine fauna, leading to toxicity-related impacts, causing adverse health impacts to marine biota (Ref. 149, Ref. 163). Fish and shellfish are particularly sensitive to oil exposure, and certain toxins can bioaccumulate. However, the toxicity of an oil is related to the bioavailability of the hydrocarbon components. The soluble or semi-soluble hydrocarbon components of a dispersed oil may dissolve and become bioavailable. Dissolved oils generally have a high toxicity, due to constituents such as BTEX, PAHs, and phenols, amongst others. Studies have shown that PAHs typically exert the most toxic effects due to their semi-soluble and not highly volatile nature, such that they can persist in the environment long enough for prolonged exposure to occur (Ref. 122). While BTEX may be a more abundant component of the oil in PW, it is highly volatile, and is typically rapidly lost either during treatment, initial mixing or through volatilisation once at water surface (Ref. 122; Ref. 261; Ref. 262). BTEX is also not known to accumulate to a large degree in marine organisms (Ref. 262).
- A variety of metals may be present in PW in varying concentrations, including aluminium, barium, boron, chromium, cobalt, iron, manganese, molybdenum, nickel, and strontium. Some metals can cause adverse impacts to the marine environment, while others are a necessary component to maintain life, with some being essential at low concentrations, but potentially toxic at high concentrations (Ref. 232). Mercury and its compounds can have high acute (short-term) and high chronic (long-term) toxicity on marine fauna. Particulate mercury in PW is typically in the form of the insoluble mercury sulfide (HgS). Mercury sulfide particulates are likely to settle near the point of discharge due to their high density and relative stability as a solid within sediments.
- A range of process chemicals (Section 3.3.2.5) may be present in very low concentrations in the PW discharge however are not expected to change the risk profile of the treated PW outside the discharge zone.

Marine fauna

Fish communities of the ridgeline may be exposed to the water quality changes, while migrating cetaceans and foraging whale sharks may occasionally also intersect the discharge zone.

As the plume is dynamic and moving constantly depending on the tides, currents, winds, and internal waves, transient biota such as migrating whales or whale sharks, are unlikely to be exposed to constituent concentrations for extended durations. Given the limited spatial extent of water quality changes (~850 m from the platform), the infrequent and short duration of the potential interaction of these fauna with the PW plume, and that only a small proportion of the migrating/foraging population can intersect the discharge plume, the potential impacts to large mobile marine fauna are expected to be short-term and localised. Therefore, the remainder of this consequence assessment is focussed on the fish communities of the ridgeline.

Of the constituents present in the PW discharge, hydrocarbons (such as TPH, BTEX (MAH) and PAHs), phenols, organic acids, and metals in their concentrated forms have the potential for acute and chronic affects to marine biota.

Fish (including those associated with the ridgeline habitat), may be exposed to low concentrations of hydrocarbons and other constituents in the water column within the discharge zone. However, the plume is strongly buoyant and interaction with the seafloor will only occur after vertical mixing of this plume. For example, TPH discharged at 30 mg/L requires 600 dilutions in order to be diluted below detection by method EP080/071 at ALS (50 µg/L) and 4,300 dilutions to be below chronic low reliability trigger criteria of 7 µg/L suggested by Tsvetnenko (Ref. 164). Modelled dilutions and field verification shows dilutions to be in excess of these values at the edge of the NFR for discharge rates up to 150 m^3/h (noting that this is achieved at ~155 m from the platform). Additional dilutions will occur in the far field as well as in the vertical plane prior to contacting the seabed. Further, some fish are able to metabolise and excrete hydrocarbons, potentially reducing physiological effects to fish exposed to PW hydrocarbons (Ref. 233).

It is not predicted that PW hydrocarbons will have long lasting and permanent impacts on fish populations. For example, Bakke et al. (Ref. 233) reported that Alkylphenols and PAHs in PW are rapidly metabolised in Atlantic cod (*Gadus morhua*). Similarly, King et al (Ref. 234) reported hydrocarbon-degrading bacteria in the liver and bile of fish collected from their study on the NWS. Bakke et al. (Ref. 233), who reviewed individual, population and ecosystem level biological responses to PW further concluded that the spatial scale of impact from PW discharge was insufficient to impact populations of marine organisms. Reed and Hetland (Ref. 235) reported that north Atlantic species of demersal fishes exposed to Alkylphenols associated with PW was too low to impact the reproductive viability of the stocks of these species. King et al. (Ref. 234) found that populations of two species of fish (*Carangoides* sp. and *Plectropomus* sp.) near a platform discharging PW into the NWS, Australia, may have been exposed to chronic, low levels of hydrocarbon pollution. However, they suggested that this result is inconclusive given that there was evidence that 'impact' and reference populations of these species, at the Montebello Islands, were being exposed to hydrocarbons seeping naturally into the marine environment.

In summary, based on the review of available literature, and considering the nature of the PW hydrocarbon constituents, the substantial dilution before the plume reaches the seabed and associated ridgeline fish communities, it is predicted there will be no acute and chronic impacts to fish populations on the ridgeline or other adjacent habitats.

Fishes can also bioaccumulate heavy metals through food and via water, but uptake by individuals and by different species of fish is dependent on many factors including the metal's form (inorganic versus organic), water chemistry and behavioural traits (feeding, range) of the fish species in the receiving environment. Ref. 236 reviewed acute and chronic toxicity of metals relating to a variety of fish species and found mercury (inorganic and methyl) and copper to be the most toxic. Some heavy metals, such as mercury are persistent and can bioaccumulate (Ref. 237); however some fish species may be able to metabolise metals potentially reducing the risk of accumulating lethal concentrations (Ref. 238). PW sampling has detected low levels of mercury, although it is not consistently detected. Modelling and verification shows 1,000-5,000 dilutions within close proximity to the discharge. For bioaccumulating substances such as mercury, the ANZG 99% inorganic (dissolved) mercury criteria is anticipated to be met within this region. Therefore, the spatial extent of the zone where bioaccumulating substances exceed WQ guidelines is predicted to be small.

The long-term effects of metals on fish populations are not straightforward to predict given most studies examining the toxicity of metals on fishes were laboratory based and often characterized by treatment concentrations that free ranging fish in the wild are unlikely to be exposed to for even short durations. Further, given the size of the mixing zone relative to available habitat and the wide distribution of most fish species in the region it is unlikely sufficient number of fish will be exposed to concentrations over a duration that would illicit a population level response. For this reason, the ecosystem function of fishes in the area is not predicted to be impacted.

In summary, exposure of constituents such as metals to fish communities, could result in localised toxic effects on individual fish, but with no ecosystem function changes or chronic level impacts to fish populations. The potential consequences of water quality changes from the PW discharge are localised and long-term impacts to individual marine fauna, ranked as Minor (5).

Marine habitats

The PW discharge plume is buoyant and will move towards the surface soon after discharge (Ref. 172; Ref. 173). In the unlikely event dissolved constituents in the plume contact the seabed; this would occur post the plume reaching the surface, where modelling shows ANZG criteria will be met. Further dilutions would then occur from the surface, though ~70 m water column to the seabed.

Particulate fallout from the PW discharge may deposit on the seabed. Based on the modelling results, for the spatial extent of seabed/sediment interaction, particulate fallout from the PW plume is likely to be highest within the vicinity of the platform, and metals deposition (such as mercury) is predicted to meet the ANZG sediment triggers based on sampled concentrations and forecast flowrates (Ref. 173). Should flow rates or composition change beyond those anticipated, modelling indicates sediment quality criteria can continue to be met with treatment (such as filtration).

As per Section 4.3.5, seabed adjacent to the platform area appears to have only an occasional coverage (2–10% cover) of an array of benthic sessile invertebrates (Ref. 29). The platform ridgeline habitats are considered in this assessment to take into account that hard substratum can provide habitats that generally support higher amounts of benthic fauna (Ref. 28). As per Section 4.3.5, the ridgeline habitat includes gorgonians and sponges which may be exposed to very diluted PW (with dissolved constituents in the water column) and particulate metals depositing at the seabed.

The potential for PW to reduce connectivity of organisms is based on the conservative premise of an 850 m discharge boundary, which, in the worst case that all benthic organisms and habitats within the mixing zone were affected, would cover the width of the ridgeline, potentially fragmenting this habitat in two. Given the positive buoyancy of the PW, any diluted constituents are highly unlikely to contact the sea floor, and only heavy particulate matter, such as some metals, have the potential to sink and directly impact organisms. As such, the potential to impact benthic organisms is reduced, and connectivity of pelagic organisms that are largely transitory is highly unlikely to be impacted.

Marine organisms maintain connectivity among populations via movement of individuals at different life-history stages. In the marine environment the most prevalent mechanism of movement is the movement of gametes from broadcast spawning taxa with oceanographic currents (Ref. 240). Due to the broadcast spawning strategy and pelagic larval stage of most marine organisms, they have less reliance on habitat continuity to maintain population connectivity than terrestrial species, which can be affected by habitat fragmentation at even small scales (e.g., Ref. 247; Ref. 245). Evidence of maintained connectivity among fragmented habitats in marine organisms can be seen in deeper sea populations separated by thousands of kilometres (Ref. 258; Ref. 259). These principles of connectivity are considered in the design of marine reserves, and established literature suggest that connectivity among reserves is maintained even when they are separated by distances of tens of kilometres (Ref. 242; Ref. 246).

Broadcast spawners release gametes into open water for fertilization and larvae development. Gametes and larvae are transported with oceanographic currents, which can influence population structure (Ref. 244; Ref. 241). Broadcast spawning corals, such as those in the sub-class Hexacorralia, can maintain high levels of genetic connectivity among populations separated by up to 25 km (Ref. 245), with the average dispersal distance of mobile and sessile invertebrates being between 25 km and 150 km (Ref. 246). Gorgonians, a dominant taxa on the ridgeline, are largely broadcast spawners.

Not all marine species are broadcast spawners with a pelagic larval stage, and examples include species that brood eggs or embryos. Brooders do not broadcast spawn gametes, but instead take some level of parental care of eggs and embryos, either through nesting, guarding, substrate spawning or similar such mechanisms. Some taxa, such as some gorgonians (Ref. 239) and fish are brooders and have a more limited dispersal range compared to broadcast spawning species (Ref. 240). However, even brooding invertebrates, such as some gorgonians can maintain connectivity over distances on the order of kilometres (Ref. 243).

Therefore, even in the worst case that 850 m of benthic habitat and species around the platform are affected by PW (likely a significant overestimate since PW is buoyant, and modelling and verification indicates high levels of dilution in the order of ~1,000-5,000 in close proximity to the discharge point), there are unlikely to be any significant effects of the PW on habitat connectivity due to fragmentation. When considering the potential for the platform to fragment a section of the ridgeline, the fragmented distance is minor compared to dispersive capability of taxa, even brooders.

Corals and other marine invertebrates, including bivalves, can take up contaminants, such as heavy metals, via seawater or through feeding (Ref. 184). In some locations, such as the NWS, this may occur independent of human activity because oil seeps naturally from the seafloor (Ref. 234) or there is metal bearing substratum. For corals, the uptake of heavy metals through feeding can involve polyp capture of particulate matter, contaminants adhering to sediment or in plankton (Ref. 184). A review of literature was undertaken to better understand the potential risk of acute and chronic impacts to the marine habitats and communities (e.g., gorgonians and sponges) on the ridgeline from PW constituents.

In terms of constituents, the review focused on heavy metals and PAHs that may accumulate in some organisms. There are a limited number of toxicological studies relating to sponges and gorgonians, and especially to taxa found in the lower euphotic zone or relating to sea fans without zooxanthellae. The effects of contaminants on shallow water zooxanthellae corals (e.g., Ref. 184) are better understood, but extrapolations of these findings to deep water non-zooxanthellae corals may be uninformative. For example, Bastidas and Garcia (Ref. 248) found that zooxanthellae in a host coral of the species *Porites astreoides* accumulated more mercury than the polyp tissue.

The literature suggested that acute impacts to gorgonians and sponges from contaminants, under the applied experimental treatments, are non-lethal, at least for adult colonies. Non-lethal responses associated with heavy metals and hydrocarbons included sclerite sloughing, mucus secretion and tissue necrosis in gorgonians (Ref. 183; Ref. 184). Physiological responses, such as change in respiration rates, were also apparent in at least one species of gorgonian as a result of thermal stress (Ref. 250). In terms of sponges, PAHs and heavy metals may inhibit the settlement of larvae (Ref. 185; Ref. 251).

The long-term or chronic effects of heavy metals and other contaminants on these organisms are not well documented and are difficult to predict. One reason for this is that most experiments assessing the effects of contaminants occur over weeks or months. In contrast, discharges will normally last years or decades. Experimental treatment levels (concentrations) may also be unrealistically high over ecologically relevant spatial scales. Another reason is that most reported field-based studies investigating marine community level responses to discharges relating to semi-enclosed water bodies, such as bays, or coastal waters (Ref. 252). In terms of PW at the platform, discharge will be in waters ~70 m deep and in a dispersive, open water environment ~140 km off the mainland.

Some organisms may accumulate heavy metals and PAHs independent of human actions. For instance, oil seeps in the NWS might be contributing hydrocarbon into marine waters and thus organisms are exposed naturally to chronic concentrations of hydrocarbons (Ref. 234). It is unclear if this would increase or decrease their sensitivity to exposure of hydrocarbons from other sources. Some gorgonians and other marine organisms are known to accumulate heavy metals and other contaminants (Ref. 184). However, there is potential for gorgonians to eliminate heavy metals through mucus secretion and other mechanisms (Ref. 248; Ref. 184) and azooxanthellate hard corals, such as *Tubastraea*, can incorporate metals into skeleton without suffering obvious signs of stress (Ref. 184).

Although heavy metals and PAHs can potentially result in sub-lethal and lethal effects to individual corals under experimental conditions, it is unclear if discharges of PW, especially in deep water and dispersive marine environment will have a population or ecosystem level response. This will depend on the total population at risk from PW discharge. If impacts remain localised (i.e., within the predicted mixing zone) it is a reasonable assumption that population and ecosystem level responses are not predicted. As mentioned previously, modelling has predicted that gorgonians and sponges inside the discharge zone may be exposed to constituents above ANZG guidelines and that the populations outside will remain unaffected by PW discharge. This prediction is supported, in part, by Burns et al. (Ref. 249) who investigated the dispersion and fate of PW discharge from a platform in waters ~20-24 m deep off the NWS. Using bioaccumulation assessments of oysters and water quality modelling, the authors concluded that potential biological impacts from oil would remain largely within ~900 m of the discharge point. They also noted that due to degradation and dissipation processes there was no long-term build-up of contaminants in sediment (Ref. 249). Similarly Bakke et al. (Ref. 233), who reviewed individual, population and ecosystem level biological responses to PW in Norway waters, also concluded that the spatial scale of impact from PW discharge was insufficient to impact populations of marine organisms.

In summary, heavy metals associated with PW have the greatest potential for acute and chronic toxicity effects on marine biota. PAHs can have chronic toxic effects but are less persistent compared with some metals. Additionally, results to date have shown PAH comprises predominantly of naphthalene, often with other individual PAH analytes not being consistently detected and naphthalene values have not resulted in an exceedance of ANZG guidelines at the

boundary. Over the years, the deposition of metals (including mercury) around the platform could have toxic effects on marine biota associated with the ridgeline, however based on modelling and PW analysis, exceedance of ANZG sediment quality criteria is not anticipated. Should flow rates or composition change beyond those anticipated, modelling indicates sediment quality criteria can continue to be met with treatment (such as filtration). Additionally, if metals are taken-up by gorgonians and sponges, the effects will not necessarily lead to lethal effects in adults. Some organisms, such as gorgonians, have the capacity to metabolise heavy metals and other constituents such as PAHs. However, some metals, depending on the concentration, may inhibit larvae settlement. Ongoing PW analysis (including quarterly WET) as well as modelling and verification, indicate the risk of potential impacts to the marine habitat outside the boundary is anticipated to be incidental. That is, exposure of habitat and marine life to PW is anticipated to have a limited environmental impact outside the boundary. However, within the boundary (predominantly in closer proximity to the platform), there is increased risk of environmental impact, especially for habitat and fixed organisms such as gorgonians and sponges. The footprint will be localized; however in a worst case scenario, recovery of specific species may be classified as long term. Therefore, the potential impact from PW discharge to the ridgeline habitat is ranked as Moderate (4).	
ALARP decision context justification	
Offshore facility operations and subsequent planned discharges arising from these facilities are commonplace both internationally and nationally. The control measures to manage the risk associated with planned discharges are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding planned discharges of PW from the activity. The impacts and risks arising from planned discharges of PW constitute lower-order impacts (Table 5-3). As such, CAPL applied ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
Hazardous materials selection process	As part of the hazardous materials selection process, hazardous materials that will be discharged to the environment will undergo a detailed environmental assessment, as per CAPL's *Hazardous Materials Management Procedure* (Ref. 55)
PW treatment	The PW treatment system was selected to provide primary and secondary treatment, and tertiary treatment if required, to ensure the 30 mg/L daily average TPH concentration, during normal operations, is met. To manage periods of variable PW composition, for example during well clean ups, the PW treatment system (or equivalent temporary package) will be utilised. It is possible that the TPH in the discharge will exceed 30 mg/L for ~1–8 days for each well. During well clean-up activities PW discharge will not exceed 100 mg/L TPH daily average. Modelling and verification indicate that TPH will not be detectable in-field within close proximity to the discharge location during normal operations and well clean-ups and the EPO will be met. The daily average TPH is determined using manual laboratory samples. In addition, an analyser is used for process trending to evaluate water quality in between sampling events. If the analyser is off-line or not trending in accordance with expectations, a daily average will be calculated using not less than 4 laboratory samples.
PW monitoring	<u>Routine laboratory sampling</u> Laboratory sampling and analysis will be used to monitor performance of the system. Platform laboratory analysis (typically using a Horiba or similar) shall be normally undertaken twice every 24 hours, or not less than 4 times per 24 hours during periods where the analyser is offline or not trending in accordance with expectations. The laboratory TPH analyses methodology will likely be as per ASTM D7066 - Standard Test Method for dimer/trimer of chlorotrifluoroethylene (S-316) Recoverable Oil and Grease and Nonpolar Material by Infrared Determination or similar.

	The laboratory TPH analysis methodology will be verified at a minimum 6-monthly by a NATA certified laboratory. The laboratory sampling equipment and analysis equipment is routinely calibrated in accordance with WHS Procedure for *the Determination of TPH and Oil and Grease in Aqueous Solutions using Horiba OCMA-550* (WS2-1804-PRO-00156) or equivalent. <u>Analyser used to monitor trends</u> An online analyser is used for process trending of the produced water discharge and may provide an early indication of an increasing TPH discharge value. Continuous online monitoring of hydrocarbons in produced water is challenging given the complexity of the fluid mixture, its time variable composition with operational status, and the specificity of sensor response to a particular physical or chemical variable within the hydrocarbon mixture being analysed. To improve accuracy of total petroleum hydrocarbon (TPH) measurement in the PW discharge stream – and subsequently improve environmental management outcomes – a smart analyser solution was developed, which integrates real-time process data from throughout the Wheatstone platform with the best available analyser technology through machine learning algorithms to improve surveillance of TPH levels in the produced water. While the dataset of the smart analsyer project is small and analysis is still being undertaken on applicability, initial results are promising. The online analyser in conjunction with any enhancements associated with the smart analyser project will apply the most representative trend inputting to an alarm, alerting operators should the TPH concentration approach a threshold for management response in order to maintain water quality in accordance with the EPO. <u>Waste Water Discharges Monitoring Program</u> The Platform Waste Water Discharges Monitoring Program (Section 8.4.1.1) is designed to ensure the nature, extent, and potential effect of the PW and other discharges are assessed, and helps determine changes to water quality, sediment quality, and marine habitats. The monitoring program includes: topsides monitoring, field sampling, model verification, and WET testing (or equivalent) and where practicable, allows adaptive management changes to occur.
Operating manual and procedures	The *PW Treatment System Operating Manual* (Ref. 73) and *PW High OIW Content Procedure* (Ref. 74) will be implemented when data indicate a potential exceedance of TPH, including data from manual laboratory sampling results (>30 mg/L TPH) and analyser outputs (exceedance defined in High OIW content procedure [Ref. 74]). The manual and procedure detail actions to be taken by platform operators to check that the reported data are correct, and, if required, detail corrective actions to be undertaken to address the exceedance. <u>The *PW Treatment System Operating Manual*</u> (Ref. 73) provides information relating to the safe and efficient operation of the PW treatment system. The manual includes a dedicated Environmental Information section summarising OIW targets, sampling and analyser details, and link to the *PW High OIW Content Procedure* (Ref. 74). As per the Manual, the PW system alarm alerts operators should trends approach upper specifications, and also refers to actions in the *High OIW Content Procedure*. The Manual describes initial response and operator actions to respond to the alarm. Steps include field checks, additional manual sampling, checking the analyser results against samples analysed in the platform laboratory and production actions (e.g. correcting chemical injection settings and checking equipment performance). If OIW concentrations continue to increase after implementing the corrective actions, additional steps to choke back on high water wells (i.e. reducing high water flows) and directing off-specification PW to rich MEG tank where it can be reprocessed slowly (limited capacity) can be taken.

	The *PW High OIW Content Procedure* (Ref. 74) provides clear and precise instructions to manage a high TPH content in the PW discharge. The procedure is implemented when there is a high alarm (i.e., analyser alarm) in the PW discharge header or where a manual laboratory sample returns a level above 30 mg/L. The procedure includes steps/actions taken by production, laboratory and CCR personnel to manage the TPH in discharged PW to below 30 mg/L, including re-sampling, treatment system checks, production actions and diverting over spec PW (confirmed by laboratory sample) inboard if required for re-processing prior to release.	
CMMS	To ensure that the PW treatment system instrumentation and equipment, including the online analyser, is operating appropriately, preventative maintenance regimes have been developed and incorporated into the CMMS. Maintenance activities are managed through CMMS which is used as the main asset and inventory management system within CAPL for performing and tracking maintenance activities. Through ongoing maintenance, the operability of the system is optimised, reducing the risk of insufficient PW treatment.	
CMS	CAPL uses a competency management system (CMS) to track and manage competencies and required training for the operations workforce to ensure minimum levels are met and that personnel are trained and competent to undertake their duties.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Given the nature and scale of this activity with standard control measures in place, it is considered Remote (5) that these discharges would result in any impact to the ecological function of the particular values and sensitivities present within the OA.	
Risk level	Low (8)	
Determination of acceptability		
Principles of ESD	The potential impacts and risks associated with this aspect are spatially limited to an area around the platform, which is not considered as having the potential to affect biological diversity and ecological integrity. The highest consequence associated with this aspect is Moderate (4). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • *Hazardous Materials Management Procedure* (Ref. 55) • *PW Treatment System Operating Manual* (Ref. 73) • *PW High OIW Content Procedure* (Ref. 74) • *WHS Procedure for the Determination of TPH and Oil and Grease in Aqueous Solutions using Horiba OCMA-550* (Ref. 75).	
External context	During stakeholder consultation, no objections or claims were raised regarding planned discharge of produced water arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any	

	relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Meet ANZG guidelines* to avoid changes to water quality and sediment quality outside the discharge zone boundary	**Hazardous materials selection process** Hazardous materials discharged through the PW system are subject to the hazardous materials selection process as per the CAPL *Hazardous Materials Management Procedure*	Hazardous materials selection process assessment records (or similar).
	PW treatment PW is treated through the PW treatment system so that during normal operations the concentration of PW discharge does not exceed 30 mg/L TPH (daily average)**	Records (laboratory) indicate that the PW discharge TPH concentration does not exceed 30 mg/L (daily average) during normal operations**
	PW treatment PW is treated through the PW treatment system (or equivalent) so that during well clean ups the concentration of PW discharge does not exceed 100 mg/L TPH (daily average)	Records (laboratory) indicate concentration of PW discharge does not exceed 100 mg/L TPH (average concentration per 24 hours) during well clean up activities
	PW monitoring TPH concentration is measured: • routinely by the laboratory (normally twice every 24 hours)*** • laboratory samples 4 times per 24 hours during periods where the analyser is offline or not trending in accordance with expectations***	Records confirm TPH concentrations are measured routinely by the laboratory (normally twice every 24 hours or 4 times per 24 hours during periods where the analyser is offline or not trending in accordance with expectations)***
	PW monitoring The Platform Waste Water Discharges Monitoring Program is implemented in accordance with Section 8.4.1	Records confirm the Platform Waste Water Discharges Monitoring Program is implemented
	PW monitoring The laboratory TPH analysis methodology verified at a minimum 6-monthly by a NATA certified laboratory	Records confirm offshore laboratory TPH analysis methodology verification is undertaken at least every 6 months via NATA approved laboratory
	PW monitoring PW sampling equipment and laboratory analysis equipment is routinely calibrated in accordance with WHS Procedure for the Determination of TPH and Oil and Grease in Aqueous Solutions using Horiba OCMA-550 (WS2-1804-PRO-00156), or equivalent.	Laboratory and/or calibration records confirm PW sampling equipment and laboratory analysis equipment is routinely calibrated in accordance with WHS Procedure WS2-1804-PRO-00156), or equivalent.
	Operating manual and procedures PW Operating Manual tiered response and High OIW Content Procedure is implemented if: • manual laboratory sample >30 mg/L TPH	Records confirm PW Operating Manual tiered response and PW – High OIW Content Procedure is implemented if required

	• analyser trending indicates potential exceedance of TPH as defined in High OIW Content Procedure	
	CMMS PW treatment system is operational and maintained in accordance with the CMMS.	CMMS records demonstrate maintenance of PW treatment system.
	CMS Personnel taking samples and analysing samples are competent to ABU – 1645 Produced Water Treatment System – Comprehensive Review and CAPL Laboratory Manual standards.	Records demonstrate personnel taking samples and analysing samples have the required competency.

Notes:
** PC95 species protection criteria has been adopted from ANZG (Ref. 11), where available*
*** With the exception of well clean-ups*
**** Laboratory sampling frequency may be revised in line with the process outline in Section 8.4.1.*

6.2.6 Planned discharges—Wastewater

6.2.6.1 Seawater system and cooling water

To prevent marine growth, sodium hypochlorite is continuously dosed in the platform seawater system lift pumps so that the whole seawater system is chlorinated, resulting in the discharge of cooling water with slight traces of residual chlorine. Hypochlorite is also intermittently injected into other caissons that are in contact with seawater (for ~15 minutes, once or twice a day). The discharge temperature will be around 30-40 °C but may reach 50 °C on occasion.

The continuous dosing of the seawater lift pumps and the subsequent continuous CW discharge is the greatest volume of discharge and therefore is the focus of this assessment. Based upon the operation of the platform over the past four years, CW discharges have averaged a volume in the order of ~80,000–1,000,000 m^3/day. The continuous injection of hypochlorite into the seawater system results in the residual chlorine concentration discharged at 0–0.2 ppm via the CW caisson.

Modelling Results

Cooling Water discharge modelling has been conducted to quantify and assess the extent of the strongly buoyant discharge plume. The following modelling has occurred:

- during the development of the EIS (Ref. 26).
- optimised during FEED (Ref. 172)
- refined in 2016 (Ref. 173)
- validation of the model in 2018/19 (Ref. 219).

The EIS and FEED phase models were based on CORMIX (near field) and CMS-Flow (far field) while the refined ongoing modelling uses CORMIX (near field) and MIKE 3FM (far field). The results show the size, concentration of residual chlorine and location of the plume and where the plume temperatures approach ambient conditions.

Modelling predicts that for the maximum CW discharge volume, the maximum extent for plumes to dilute to the ANZG WQ criteria of 3 ppb for chlorine extends ~600 m from the platform (Ref. 172).

The models predict that the CW plume is strongly buoyant and will not be in contact with the seabed prior to extensive dilution (Ref. 26 ; Ref. 172; Ref. 173). The residual chlorine in the plume dilutes more than the 67 times required to meet the ANZG management guidelines before the plume first reaches the sea surface, then mixes further horizontally and vertically before potentially contacting the seabed in the far field.

The CW plume temperatures are predicted to be close to ambient conditions well within the near-field, typically within 3 °C of ambient within ~250 m from the platform (Ref. 26; Ref. 174). CORMIX predicts dilutions of 1000 to 10 000 (which is within 0.05 °C of ambient temperature) within the boundary zone and without contact of the seabed in the nearfield (Ref. 172; Ref. 173).

Model verification

In November 2018, a comprehensive field campaign (Ref. 219; Ref. 222) was executed to confirm that that the required dilutions with regard to environmental guidelines were being achieved, and to validate model predictions. The campaign involved controlled injection of Rhodamine WT (RWT) dye into CW and PW discharges from the platform, in conjunction with intensive in situ measurements of the resulting ‘spiked’ plumes. Field measurements involved sample retrieval and fluorometry directly from the vessel, fluorometry and sample retrieval from an ROV despatched to traverse the plume, and sensor measurements by ocean glider and an unmanned aerial vehicle (AUV) to ascertain marine conditions, map plume geometry, and quantify dilutions associated with the discharge plumes. An acoustic doppler current profiler (ADCP) and temperature string were deployed on a fixed mooring for the duration of the campaign.

As a result of the open caisson design, flowrate and free-falling discharge from platform level within the caisson, the CW plume was observed to contain a very high content of entrained air. This air content, which was not considered in previous CW plume assessments, clearly dominates the near-field behaviour of the waste stream until the air is lost to the atmosphere (Ref. 219).

The results of the field campaign strongly suggest that nearfield mixing was drastically underestimated given the presence of entrained air (i.e., model predictions are highly conservative). Consequently, the monitoring indicates that the initial discharge zone of 850 m is conservative and remains appropriate for continued operations of the facility.

6.2.6.2 Drainage

The discharge from open drains is intermittent, with the oil-water treatment system designed to meet a discharge concentration of 15 mg/L or less. Discharge rates will vary significantly according to the sources of open drains effluents, including firewater and rain/stormwater. Drainage water can contain traces of emulsified oil and grease, diesel, hydraulic oil, lubricants, cleaning fluids, and similar contaminants, and low concentrations of sodium hypochlorite will be present from the routine caisson dosing and occasional draining of systems (such as tempered water, HVAC, firewater main and potable water).

During platform maintenance, breaking containment of vessels, opening lines, high-pressure cleaning, and topping up and changing fluids may be performed. During these processes, most fluids will be captured in drip trays or the drainage system and passed through the oil-water treatment system; however, occasionally, depending on the location of the equipment on the topsides, discharges may bypass the drainage system (e.g., firewater main).

Fire protection system testing is mandatory for safety requirements and will result in ~5 m^3 of foam discharging through the grating on the topsides several times per year. If the active fire protection system is used, treated sea water with low concentrations of hypochlorite may be released to the ocean.

6.2.6.3 Sewage, greywater, brine and food

Sewage discharge is ~30 m^3/day during normal operations workforce rates (POB 96), and 33–52 m^3/day during occasional and short-term peak workforce periods. Due to the low discharge rate, the sewage and greywater discharge is predicted by modelling to be highly diluted within the near-field, with no far-field impact (Ref. 26). The kitchen waste system includes a macerator, which discharges to the ocean through a dedicated discharge pipe. Brine is discharged as wastewater from the reverse osmosis process (potable and demineralised water), and is predicted to be ~6–15 m^3/hour with salinity levels ~31% higher than the receiving open-ocean environment. Local wave, tide, and wind action enhance the brine plume diffusion and mixing immediately on discharge and the brine plume will be rapidly diluted and dispersed by ambient currents (Ref. 26). At a discharge depth of 40 m, the sewage effluent was buoyant, typically diluted by a factor of ~2000 by the time it reached the surface of the water column (Ref. 26) and still further diluted before potentially remixing vertically in the column and contacting the seabed.

For greywater and brine, based on the forecast biodegradability, depth of discharges, and exposure of the discharges to open ocean currents, no detectable impacts to background water and sediment quality are forecast (Ref. 26) and are therefore not discussed further below. No detectable impacts to marine sediment quality are forecast for any these discharges (Ref. 26).

6.2.6.4 Risk assessment

Source			
Activities identified as having the potential to result in planned discharges are: • start-up and operation of the platform. The types of planned discharges include CW, drainage, fire-fighting foam, sewage, greywater, food wastes, brine, and potable water.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Planned discharges from the platform may result in: • localised and temporary reduction in water quality.	5	A change to ambient water quality may result in: • indirect impacts to fauna arising from chemical toxicity • changes to predator / prey dynamics	6
Consequence evaluation			
Localised and temporary reduction to water quality To understand the extent of exposure, CW has been selected as a case study to enable a conservative assessment to be undertaken given it comprises the largest volume and is a continuous discharge. As detailed previously, infield monitoring has validated that the extent to which water quality may be affected by these discharges is no more than 850 m.			

Given that the platform is located within a highly dispersive, open ocean location, these planned discharges are subject to extensive and rapid dilution by open ocean currents and tides (Ref. 174). In-field monitoring has validated the assumption that they dilute rapidly and do not persist long in the marine environment. On the basis that these discharges will result in a localized change to the environment with impacts that are short in duration, CAPL has ranked the consequence associated this impact as Minor (5).
Potential chemical toxicity Changes to ambient water quality associated with various planned releases may occur up to ~850 m from the platform. The values and sensitivities with the potential to be exposed to toxicity effects within this area include: • Pygmy Blue Whale (distribution) • Whale Sharks (foraging) • Flatback Turtle (internesting) • Ridgeline habitat and associated communities. Infield monitoring (Ref. 219) confirmed that due to entrained air, the plume is strongly buoyant, thus exposure to benthic habitats such as the ridgeline habitat will not occur. Consequently, this has not been considered further. According to the *Marine Bioregional Plan for the North-West Marine Region* (Ref. 28), nutrient pollution is only listed as a pressure for turtles, but potential impacts are limited to discharges nearshore. Additionally, the *Recovery Plan for Marine Turtles in Australia* (Ref. 94) lists chemical discharges as a threat. Although the discharge plume intersects the Flatback Turtle internesting BIA, Whittock et. al. (Ref. 92) reported that Flatback Turtles preference habitats within proximity of the coast and at relatively shallow depths during the internesting period. Specifically, during the study, a maximum distance from the nearest coast and maximum water depth of 27.8 km and <44 m respectively was recorded, with the mean maximum distance away from the nearest coast and mean water depth being less than 6.1 km and <10 m respectively (Ref. 92). Given that the platform is located ~50 km from the nearest coast, even though the Flatback turtle internesting area may be exposed to changes in water quality, due to the distance offshore, these discharges are not expected to result in any significant impacts. The *Blue Whale Recovery Plan* (Ref. 100) states that marine pollution can have a variety of possible consequences for Blue Whales at an individual and population level, or indirectly through harming their prey or the ecosystem. Marine pollution is not listed as a threat within the *Conservation Advice (Rhincodon typus) Whale Shark* (Ref. 96). As both cetacean species and whale sharks are highly mobile, they are not expected to be exposed to the discharge plume for a prolonged period of time thus any impacts are expected to be limited. Given that all the discharges are positively buoyant, and as they are all discharged in water depths >35 m, on release they will rise through the water column and subsequently dilute and disperse quickly. The platform is located within an open water dispersive environment thus discharges are subject to rapid dilution and dispersion. Monitoring has verified that impacts are limited in extent within close proximity of the discharge location and consequently, prolonged exposure to transient marine fauna species are not expected. Given the rapid dilution and dispersion conditions, and the transient nature of marine fauna, bioaccumulation in the receiving environment and sublethal impacts are expected to be limited. Consequently, the release of waste water discharges are expected to result in a limited environmental impact, and the consequence level was determined as Incidental (6).
Changes to predator/prey dynamics At a discharge depth of >35 m, the sewage effluent is buoyant, and the expected low volumes of these discharges are expected to dilute and dissipate to surface waters above the discharge point of the platform. Effects on environmental receptors along the food chain – fish, reptiles, birds, and cetaceans – are not expected beyond the immediate vicinity of the discharges in deep open waters (Ref. 175). Given that sewage discharges are positively buoyant, only pelagic species are likely to be impacted with no exposures to benthic habitat expected. The values and sensitivities with the potential to be affected by changes in predator/prey dynamics within 850 m of the platform include: • Whale sharks (foraging) • Lesser Crested Tern, Wedge-tailed Shearwater (breeding). Studies into the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in

enclosed areas (Ref. 176) and suggest that zooplankton composition and distribution in areas associated with sewage dumping grounds are not affected. However, if any changes in phytoplankton or zooplankton abundance and composition occur, they are expected to be localised, typically returning to background conditions within tens to a few hundred metres of the discharge location (Ref. 177; Ref. 178; Ref. 179). Given the distance from shore, these incidental discharges are not expected to influence foraging behaviours of seabirds (specifically the Wedge-tailed Shearwater), and thus are not considered further. As described above, plankton communities are not affected by sewage discharges, but if they are, such effects would be highly localised (expected to return to background conditions within tens to a few hundred metres of the discharge location). Consequently, impacts to Whale Shark foraging behaviours are not expected, and thus are not considered further. Although fish have the potential to be attracted to these discharges, any attraction and consequent change to predator/prey dynamics is expected to be limited to the area of the release and thus is expected to result in localised feeding behavioural changes to fish species. Given the rapid dilution of the discharged material, such behavioural changes will be temporary in nature and not expected to significantly alter existing predator/prey dynamics. Overall, a change in water quality as a result of sewage or food discharges are unlikely to cause a change in behaviour of marine fauna at a measurable level and will not result in a change in the viability of the population or ecosystem As water quality changes are predicted to be rapidly dispersed, and the discharges are not expected to adversely affect marine habitats and fauna, any increased predation is not expected to result in more than a limited environmental impact. CAPL has thus ranked the potential consequence as Incidental (6).	
ALARP decision context justification	
Planned discharges from offshore facilities are commonplace nationally and internationally. The control measures to manage the risk associated with these planned discharges are well defined and are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding vessel discharges arising from the activity. The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
Hypochlorite dosing	The hypochlorite dosing package is commissioned, tested and calibrated during initial start-up. The seawater system has been designed to meet the continuous hypochlorite dosing levels that ensure the entire system achieves a residual chlorine content of up to 0.2 ppm discharged through the CW caisson.
CMMS	Through ongoing maintenance, the dosing package and seawater system will be maintained, thereby ensuring the system is operating at optimal capacity and reducing the risk of elevated residual chlorine levels.
	The drainage and oily water system will be maintained, thus ensuring the system is operating at optimal capacity to treat oily water.
Oil-water treatment system	Potential oil contaminated streams from the platform drainage system are treated through the oil-water treatment system, prior to discharge at or below 15 mg/L, and is verified through laboratory sampling and analysis. The platform drainage system design ensures potentially oil-contaminated streams will be directed to the slops tank, where they will undergo coarse OIW separation, and then further processed in the slops water secondary treatment package before discharge through the open drains caisson. Treated water from the package is discharged to the open drains caisson while the recovered oil is returned to the oil compartment of the slops tank. The Product Design

	Specifications are to achieve <15 mg/L in the discharged treated water (Ref. 180; Ref. 181). The design of the open drains system is based on an optimisation between providing sufficient capture, storage, and treatment of cyclonic rainfall and the size and weight of such structural storage. The system is designed to meet 15 mg/L, which is standard in the marine and oil and gas industry. Commissioning tests and routine laboratory sampling verifies the adequacy of the treatment system to confirm that it achieves 15 mg/L. The secondary treatment package vessel includes differential pressure and level alarms which can indicate poor separation of oil. These alarms trigger response actions by platform personnel in accordance with the Slops Water Secondary Treatment Package section of the Hazardous and Non Hazardous Drains Systems Operating Manual Volume 1 – Process and Equipment Description (Ref. 180). The system is tested and calibrated if the response to the alarm indicates the oily water treatment is not achieving 15 ppm.	
Hazardous materials selection process	As part of the hazardous materials selection process, hazardous materials that will be discharged to the environment will undergo a detailed environmental assessment, as per CAPL’s *Hazardous Materials Management Procedure* (Ref. 55)	
Sewage treatment system	Sewage will be macerated through the sewage treatment system prior to discharge. Macerating sewage is standard industry practice, ensuring the substance disperses in the receiving environment with minimal effects to water quality. The sewage treatment plant and food waste macerator is maintained. Regular maintenance ensures the system is operating and functioning as intended.	
Food waste discharge	Food waste macerated and discharged at a particle size ≤25 mm is standard marine industry practice; this size ensures that the discharges are rapidly diluted and dispersed by ambient ocean currents (Ref. 26) with minimal effects to water quality.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and Risk Level Summary		
Likelihood	With the numerous controls in place, the expected volumes, concentrations, and types of fluids discharged, rapid dispersion, and the predicted limited spatial extent of water quality changes, it is considered Remote (5) that these discharges would result in any impact to the ecological function of the particular values and sensitivities present within the OA.	
Risk Level	Very low (10)	
Determination of Acceptability		
Principles of ESD	The potential impacts and risks associated with this aspect are spatially limited to an area around the platform, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered for this aspect include: • *Marine Bioregional Plan for the North-West Marine Region* (Ref. 28)	

	• *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94).	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • *Hazardous Materials Management Procedure* (Ref. 55) • *Hazardous and Non Hazardous Drains Systems Operating Manual Volume 1 – Process and Equipment Description* (Ref. 180).	
External context	During stakeholder consultation, no objections or claims were raised regarding wastewater discharges arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to marine habitats and fauna from platform discharges during petroleum activities	**Hypochlorite dosing** The seawater system (continuous dosing) meets the residual chlorine discharge limit of 0.2 ppm for CW and ongoing monitoring is performed in accordance with Table 8-11	Laboratory (LIMS) records demonstrate the seawater system CW discharge meets the residual chlorine limit of 0.2 ppm for continuous dosing and ongoing monitoring is in accordance with Table 8-11
	CMMS Maintenance of the dosing package and seawater system is in accordance with the CMMS	CMMS records of the dosing package and seawater system
	CMMS The oil-water treatment system is maintained in accordance with the CMMS	CMMS records show maintenance of the oil-water treatment system
	Oil-water treatment system Oily water is treated through the oil-water treatment system to meet the 15 mg/L discharge concentration	Laboratory records of weekly analyses (when discharging) show the oil-water treatment system meets the 15 mg/L discharge concentration
	Oil-water treatment system Response to alarms (for the Slops Water Secondary Treatment Package) are in accordance with *Hazardous and Non Hazardous Drains Systems Operating Manual Volume 1 – Process and Equipment Description*	CMMS records show response to alarms (for the Slops Water Secondary Treatment Package) in accordance with *Hazardous and Non Hazardous Drains Systems Operating Manual Volume 1 – Process and Equipment Description*
	Hazardous materials selection process Fluids planned for discharge are subject to the hazardous materials selection process as per the CAPL *Hazardous*	Hazardous materials selection process assessment records (or similar)

	Materials Management Procedure	
	Sewage treatment system Sewage is discharged after being macerated through the sewage treatment plant	Records verify sewage is discharged after maceration through the sewage treatment plant.
	Sewage treatment system The sewage treatment system and food waste system are maintained	Inspection records (or equivalent) demonstrate maintenance of the sewage treatment system and food waste system.
	Sewage treatment system Shut-downs and alarms are investigated and critical macerator operability issues rectified prior to restart of equipment	Inspection records (or equivalent) verify operability issues rectified.
	Food waste discharge Discharged food waste is macerated through the food waste system to particle sizes ≤25 mm	Records verify that food discharged is macerated to ≤25 mm when discharged.

6.2.7 Unplanned release—Waste

Source			
Activities identified as having the potential to result in the unplanned release of waste are: • start-up and operation of the platform. Because waste is generated on board the platform, inappropriate management and storage has the potential to result in a release to the environment.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	Unplanned release of waste to the environment may result in: • marine pollution resulting in entanglement or injury of marine fauna	6
Consequence Evaluation			
If hazardous or non-hazardous waste is lost overboard, the extent of exposure to the environment is limited. Marine fauna most at risk from marine pollution include marine reptiles and seabirds, through ingestion or entanglement (Ref. 94; Ref. 182). Ingestion or entanglement has the potential to limit feeding or foraging behaviours and thus can result in marine fauna injury or death. Although marine debris is identified as being of concern to marine reptile species under the *North-west Marine Bioregional Plan* (Ref. 28), the risk is associated with ‘land-sourced plastic garbage, fishing gear from recreational and commercial fishing abandoned into the sea, and ship-sourced, solid non-biodegradable floating materials disposed of at sea’. This type of waste is not associated with the activities described under this EP and given the restricted exposures and the limited quantity of waste with the potential to cause marine pollution that is expected to be generated from petroleum activities, it is expected that any impacts from marine pollution would result in limited impacts to individuals. Thus, CAPL ranked this consequence as Incidental (6).			
ALARP decision context justification			
Offshore facility operations, and the subsequent management of waste, are commonplace and well-practiced activities within the industry. The control measures to manage the risk associated with an accidental release of waste are well defined via legislative requirements that are considered standard industry practice. There is a			

good understanding of the release pathways, and the control measures required to manage these events are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity. An unplanned release of waste is a lower-order risk in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.		
Good practice control measures and source		
Control measure	**Source**	
Waste management	Waste management strategies are in place for platform operations, and are aimed at preventing both accidental pollution, and pollution from routine operations. These waste management strategies describe various requirements that are to be applied when managing waste offshore; specifically, that lidded bins are available for use in open areas of the platform, and that records are maintained of waste transferred.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Marine pollution arising from mismanaged waste offshore has occurred previously in the industry but is not expected to occur during these activities, given the control measures in place. As such, the likelihood of incidental consequences to values and sensitivities from an unplanned release of waste is considered Remote (5).	
Risk Level	Very low (10)	
Determination of acceptability		
Principles of ESD	The potential impact associated with this aspect is limited to individuals and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • *Marine Bioregional Plan for the North-West Marine Region* (Ref. 28) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
No uncontrolled release of waste to the	**Waste management**	Records confirm that platform waste management is being

environment during petroleum activities	Platform waste is managed by: • lidded bins are provided in open areas of the platform where waste has a risk of being blown to the ocean (e.g., general waste, loose plastic) • records of waste transferred from the platform will be maintained	implemented, specifically including presence of lidded bins and waste transfer records

6.2.8 Unplanned release—Loss of containment

Source

Activities identified as having the potential to result in a minor LOC event:

- start-up and operation of the platform.

Based on the activities described in this EP, the following potential minor LOC scenarios were identified:

- corrosion, mechanical failure/damage, or fire/explosion during hydrocarbon processing, resulting in a loss of production fluids[1]
- mechanical failure/damage of platform infrastructure, resulting in the loss of MEG[2]
- mechanical failure/damage, or human error during bunkering, resulting in loss of various fluids including diesel, MEG, or TEG[3]
- mechanical failure/damage during crane activities, resulting in loss of hydraulic fluids[4]
- mechanical failure/damage, or human error during storage and handling, resulting in loss of various fluids including diesel, chemicals, or waste[5].

[1] A hydrocarbon processing LOC may result in the release of production fluids, ~<50 m^3. This maximum credible volume is based on the largest individual condensate inventories, calculated in the platform Safety Case release scenarios (Ref. 18).

The diesel storage tank has a capacity of 135 m^3; however, the location and design of this tank is such that a LOC scenario was deemed as non-credible during the risk assessment process.

Note: as the platform is not a floating facility but is resting on the seabed, a topside loss of containment event leading to an explosion would not result in structural collapse/integrity failure (Ref. 18). Instead, an explosion on the topsides could result in individual production fluid inventories being released to the ocean. It is expected that maximum credible volumes associated with this event are ~<50 m^3 (Ref. 18).

[2] A vessel collision with the platform legs may result in the release of MEG from the storage tanks (~<60 m^3 of MEG over 4 hours).

A study was conducted to evaluate the ship collision hazards to the platform, with the overall objective to determine which vessels have sufficient impact energy to cause progressive collapse of the facility. It was concluded that for all vessels associated with these activities, drift-off and drive-off collisions have insufficient impact energies to cause platform collapse (Ref. 18). Furthermore, the above-deck height of the vessels is low enough that they would clear the bottom of the deck, or only cause minor damage to the topsides structure. It was further concluded that a supply vessel collision would result in minor structural damage due to insufficient impact energy (Ref. 18).

[3] Platform bunkering – single point failure may result in the release of diesel, MEG, TEG (~10 m^3 over 15 minutes). This volume was identified as 15 minutes of transfer at the full pumping rate as per AMSA Guidance on oil spill planning (Ref. 149). Diesel has the highest potential impact to receptors and therefore is the worst-case release for this group of spill scenarios.

[4] Hydraulic systems – single point failure (~<10 m^3 of hydraulic fluids). This volume is based on the volumes of hydraulic fluids stored in the crane hydraulic system.

[5] Bulk storage and handling on the topsides single point failure may result in substances reaching the marine environment (~<10 m^3).

Potential impacts and risks

Impacts	C	Risks	C
N/A	-	Unplanned release of hazardous material to the marine environment may result in: • indirect impacts to fauna arising from chemical toxicity	6

Consequence evaluation	
The largest platform LOC event is estimated to be ~50–60 m^3 of condensate or MEG, and therefore these scenarios has been used as the basis of this consequence evaluation. A surface release of ~50–60 m^3 of condensate or MEG would be expected to temporarily change the water quality within the immediate vicinity of the release. The aquatic toxicity of MEG is very low; and is on the OSPAR list of substances that are considered to pose little or no risk to the environment once released (PLONOR), and is not expected to result in adverse impacts to habitats or fauna Once on the surface, condensate will rapidly evaporate with only a small proportion dispersing in the surface layers of the water column under moderate winds and mixing conditions (Section 7.1.2.1). The values and sensitivities within the OA the potential to be exposed to decreased water quality from an unplanned surface LOC release include: • Humpback Whale (migration) • Pygmy Blue Whale (distribution) • Whale Shark (foraging) • Flatback Turtle (interesting buffer) • Whale Shark (foraging). Based on the nature of these unplanned releases, which are non-continuous and expected to occur in a location where no specific sedentary behaviours for values and sensitivities have been identified, the extent and severity of any potential impact is expected to be limited. Given the nature of unplanned releases covered under this EP and the transient nature of identified values and sensitivities, fauna would need to pass directly through the plume almost immediately upon release to be impacted. Any potential impact from such an event is expected to be limited, thus the consequence level was determined as Incidental (6).	
ALARP decision context justification	
Operation of offshore facilities is commonplace and well-practised both nationally and internationally. The control measures to manage the risk associated with these unplanned discharges are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding planned discharges from subsea operations arising from the activity. The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
CMMS	The diesel, MEG, and TEG tanks have high-level alarms that trigger an audible alarm to stop bunkering. This ensures operators are made aware of overfilling, and reduces the potential for spills. Routine testing ensures the alarms are functioning correctly.
	Ongoing maintenance of the platform navigation equipment ensures equipment is operational and provides situational awareness of maritime traffic movements, thereby reducing the risk of interference with other marine users. The equipment standards of performance are included in the Computerised Maintenance Management System (CMMS). Maintenance activities are managed through the CMMS (described in Section 8.3.2.3), which is used as the main asset and inventory management system within CAPL for performing and tracking maintenance activities.
	Platform bunkering hoses, hydraulic hoses, chemical and diesel storage areas, cranes, and hydrocarbon processing systems are maintained. The spill scenarios assessment determined that spills can occur from bunkering hoses, hydraulic hoses, chemical and diesel storage areas, dropped objects from cranes, and hydrocarbon processing systems.

	Therefore, regular inspections and maintenance ensures the mechanical and structural integrity of these systems is maintained. This reduces the risk of mechanical failure that results in spills associated with the processing, storage, handling, and transfer of liquids.	
Spill kits and drip trays	Spill kits will be provided on the platform to allow personnel to respond to minor leaks and spills and reduce the risk of spills/leaks reaching the ocean. Drip trays are available to capture drips and leaks, where safe to do so.	
MSW process	The CAPL ABU Permit to Work (PTW) system and the CAPL ABU Managing Safe Work OE process (Section 8.3.1.1) outlines a process to identify, risk assess, communicate, mitigate and control hazards associated with work that has the potential to adversely impact health, the environment and safety. The PTW system requires a permit to be authorised for SIMOPs activities (e.g. operations and maintenance activities taking place in the same area), including lifting activities and activities with the potential for dropped objects. Permits are issued on a case-by-case basis and require an activity-specific hazard and risk assessment to be completed, and if a combination of activities has the potential to impact on each other, associated activity-specific procedures are developed according to PTW and Managing Safe Work standards and procedures. The PTW system applies to both CAPL-contracted personnel and vessels, and to third-parties, such as Woodside who is required under the Julimar-Brunello FOSA to comply with the PTW system prior to conducting vessel and rig based activities on subsea infrastructure in proximity to the platform.	
Source control	The platform pipework includes numerous isolation valves including the RESDV, to ensure any loss of containment is minimised to isolated areas (as detailed in the relevant Safety Case [Ref. 19]). Testing and commissioning these valves prior to hydrocarbon introduction, ensures they are functioning correctly and capable of isolating fluids in the processing pipework, therefore reducing the risk of loss of containment scenarios. Source control, such as using the platform isolation valves, is an initial response action that can limit the volume released, thus minimising environmental impacts. CAPL has developed EOPs (1060 Platform – Response To Emergency Shutdown (ESD1) Ref. 76) for the operation of the platform that provide guidance to Operations personnel to detect, isolate, and stabilise non-routine events.	
MSRE process	The MSRE process (Ref. 53) ensures that various legislative requirements and CAPL standards are met. Specifically, for vessels and crew undertaking bunkering and transfers, this includes: • a dedicated radio channel is agreed between vessel and receiving facility before commencing activity • checklists are completed prior to transfers.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	The various prevention and mitigation controls outlined above ensure the likelihood of platform operational spills are minimised, with impacts to marine fauna and habitats ranked as Unlikely (4).	
Risk level	Very low (9)	

Determination of acceptability		
Principles of ESD	The potential impact associated with this aspect would be short term, apply to some individuals, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation or other requirements were considered relevant to this aspect.	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • EOPs (Ref. 76) • Wheatstone Downstream ERP (Ref. 82).	
External context	No comments regarding on-platform spill events were received by stakeholders during consultation.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control Measure**	**Measurement criteria**
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**CMMS** High-level alarms of platform storage tanks are operational and routinely tested in accordance with the CMMS	CMMS records show high-level alarms are operational and tested
	CMMS Platform radar, navigational lighting and audio navigational equipment is maintained in accordance with the CMMS	CMMS records show platform radar, navigational lighting and audio navigational equipment is maintained
	CMMS Inspection and maintenance of platform hydraulic hoses, storage tanks, cranes, and hydrocarbon processing systems are in accordance with the CMMS	CMMS records show inspection and maintenance of platform hydraulic hoses, storage tanks, cranes, and hydrocarbon processing systems
	Spill kits and drip trays Spill kits and drip trays are available on the platform	Inspection records confirm spill kits and drip trays are available on the platform
	MSW process SIMOPS activities, heavy lifting activities, and activities with potential for dropped objects, will be managed in accordance with the permitting and management requirements of the Upstream and Gas Permit to Work procedure and Simultaneous Operations Standard in the Managing Safe Work OE Process	Records confirm CAPL-authorised Permit to Work documentation has been developed in accordance with the Upstream and Gas Permit to Work procedure and Simultaneous Operations Standard in the Managing Safe Work OE Process for SIMOPS activities, heavy lifting activities,

		and activities with potential for dropped objects
	Source control Isolation steps of the source control / isolation procedures (are implemented if a release is detected from the platform hydrocarbon processing systems	Records demonstrate relevant components (isolation steps) of the source control procedures are implemented if a release is detected from the platform hydrocarbon processing systems
	MSRE process Prior to commencing bunkering or transfers: • a dedicated radio channel is agreed between vessel and platform • checklists are completed	Records confirm that bunkering or transfers are undertaken in accordance with MSRE processes

6.3 Inspection, Maintenance, and Repairs

6.3.1 Subsea IMR

6.3.1.1 Seabed disturbance

<table>
<tr><th colspan="4">Source</th></tr>
<tr><td colspan="4">Activities identified as having the potential to result in seabed disturbance are:
• subsea IMR operations within the OA.</td></tr>
<tr><th colspan="4">Potential impacts and risks</th></tr>
<tr><th>Impacts</th><th>C</th><th>Risks</th><th>C</th></tr>
<tr><td>Seabed disturbance may result in:
• alternation of marine habitats.</td><td>5</td><td>N/A</td><td>-</td></tr>
<tr><th colspan="4">Consequence evaluation</th></tr>
<tr><td colspan="4">As benthic habitats upstream of the platform mostly comprise unvegetated, soft, and unconsolidated sediments with a low but varying degree of benthic invertebrate habitation (Section 4.3.5), seabed disturbance from IMR activities conducted on infrastructure upstream of the platform are not considered to pose any credible hazards to benthic habitats and communities. Consequently, benthic habitats downstream of the platform will form the focus of this evaluation.
Subsea IMR activities are expected to result in disturbance to the seabed within close proximity of subsea infrastructure. This type of activity is targeted to the specific area above or adjacent to the infrastructure within the OA, typically resulting in only a small area being affected. The largest area of seabed disturbance predicted to occur from IMR activities is associated with a major pipeline repair, which could result in ~800 m^2 of seabed disturbance (Section 3.4.1). This indicative seabed disturbance area represents <1% of the OA.
The particular values and sensitivities within the OA with the potential to be impacted by seabed disturbance include:
• continental slope demersal fish communities (KEF)
• ancient coastline at 125 m depth contour (KEF)
• ridgeline habitat and associated communities.
Although these values and sensitivities have been identified as having the potential to be impacted from IMR activities, any planned disturbance will be in close proximity of existing infrastructure. As this area has been historically disturbed, any additional disturbance is expected to have limited environmental impact.
Given the nature of the receiving environment within the OA, performing IMR activities is not expected to affect ecosystem function or connectivity of communities. As such, CAPL has ranked the consequence as Minor (5).</td></tr>
<tr><th colspan="4">ALARP decision context justification</th></tr>
<tr><td colspan="4">Seabed disturbance from IMR activities is commonplace; the activities causing this aspect are practised nationally and internationally. The control measures to manage the impacts associated with seabed disturbance are well understood and implemented by the industry.
During stakeholder consultation, no objections or claims were raised regarding seabed disturbance arising from the activity.
The impacts associated with seabed disturbance are considered lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.</td></tr>
</table>

Good practice control measures and source	
Control measure	**Source**
Inspection, monitoring and maintenance (IMM) acceptance criteria	IMR activities are undertaken only when necessary, in accordance with pre-determined IMM acceptance criteria. Acceptability of identified anomalies in subsea infrastructure is guided by predetermined acceptance criteria which define allowable identifiable defects, degradation or limits, thereby ensuring that IMR activities are undertaken as required to maintain system integrity.

IMR work procedures	Activity specific work procedures are developed and address Hazard Identification and Risk Assessment (HIRA) findings, including any additional controls identified for implementation.
Activity-specific HIRA	The HIRA will include HSE Specialist participation to identify and assess potential environmental impacts and risks associated with the specific maintenance or repair campaign proposed. The HIRA will consider relevant information, which may include: • proximity to potentially sensitive environmental receptors • other known activities and/or impacts that have occurred at that location • material minimisation • alternative materials • alternative execution methodologies • learnings from previous comparable IMR activities/campaigns. Where the HIRA identifies that risks and impacts are potentially greater than those assessed in this EP, the management of change process will be triggered (Section 8.3.2.2).

Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A

Likelihood and risk level summary	
Likelihood	N/A
Risk level	N/A

Determination of acceptability	
Principles of ESD	The potential impact associated with this aspect is limited to localised short-term effects that are not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered for this aspect include: • *Marine Bioregional Plan for the North-West Marine Region* (Ref. 28)
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding seabed disturbance arising from the activity.
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential risks associated with the activity are not inconsistent with any recovery plan, conservation advice, or relevant bioregional plan.

Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to complex habitats from petroleum activities	**IMM acceptance criteria** IMR activities undertaken only when necessary (in accordance with pre-determined IMM acceptance criteria)	Records show that IMR activities undertaken only when necessary (in accordance with pre-determined IMM Acceptance Criteria)
	Activity-specific HIRA Activity-specific HIRA undertaken prior to	Records show that activity-specific HIRA undertaken prior to

	maintenance or repair activity commencing	maintenance or repair activity commencing
	IMR work procedures IMR activity specific work procedures developed and implemented	Records show that activity specific work procedures are developed for each IMR activity and address HIRA findings, including any additional controls identified for implementation

6.3.1.2 Underwater sound

Source

Activities identified as having the potential to result in underwater sound are:

- IMR marine acoustic surveys (SSS or MBES) within the OA.

These activities result in the emission of the following type of sound:

Impulsive sound (IMR acoustic surveys)

Survey techniques are expected to emit various frequencies between 12 and 500 kHz; maximum at-source sound pressure levels are ~238 dB re 1 µPa (peak) (Ref. 186). Further to this, Lurton (Ref. 187) indicate medium to high-frequency MBES systems do not normally exceed source levels of 215–220 dB re 1 µPa @ 1 m and SSS has been previously measured with a peak source level of 210 dB re 1 µPa @ 1 m.

Potential Impacts and Risks

Impacts	C	Risks	C
Underwater sound emissions may result in: • localised and temporary change in ambient underwater sound.	5	A change in ambient underwater sound may result in: • behavioural disturbance • auditory impairment, temporary threshold shift (TTS), permanent threshold shift (PTS), recoverable or non-recoverable injury to marine fauna	5

Consequence Evaluation

Exposure Criteria

Mid-frequency (dolphins, toothed whales, beaked whales, bottlenose whales [e.g., Indo-Pacific Humpback and Spotted Bottlenose dolphins, Killer Whale, Sperm Whale]) and low-frequency (baleen whales [e.g., Blue, Brydes, Fin, Humpback, Sei, Antarctic Minke whales]) cetaceans have been identified as having the potential to be present within the OA. Exposure criteria for these species is included in Table 6-4.

Exposure criteria for marine turtles is provided in Table 6-5. Behavioural responses have been taken from McCauley et al. (Ref. 190) who reported that exposure to airgun shots caused Green and Loggerhead Turtles to display more erratic behaviours at 175 dB re 1 µPa , with turtles observed to increase their swimming activity at received sound levels of ~166 dB re 1 µPa .

Noise exposure criteria for fish is provided in Table 6-6.

Table 6-4: Noise exposure criteria (impulsive sounds) for mid-frequency and low-frequency cetaceans

Cetacean Hearing Group	PTS onset thresholds (received level) (Ref. 188)	TTS onset thresholds (received level) (Ref. 188)	Behavioural Response (Ref. 189)
Low--frequency cetaceans	L_{pk}: 219 dB $L_{E,\ 24h}$: 183 dB	L_{pk}: 213 dB $L_{E,\ 24h}$: 168 dB	$L_{pk:}$ 160 dB
Mid-frequency cetaceans	L_{pk}: 230 dB $L_{E,\ 24h}$: 185 dB	L_{pk}: 224 dB $L_{E,\ 24h}$: 170 dB	$L_{pk:}$ 160 dB

Peak sound pressure level (Lp,0-pk) has a reference value of 1 µPa, and weighted cumulative sound exposure level (LE,p) has a reference value of 1µPa2 s. The subscript also describes the accumulation period (being 24 hours).

Table 6-5: Noise exposure criteria (impulsive sounds) for marine turtles

PTS onset thresholds (received level) (Ref. 191)	TTS onset thresholds (received level) (Ref. 191)	Behavioural Response (Ref. 190)
L_{pk}: 232 dB $L_{E,\ 24h}$: 204 dB	L_{pk}: 226 dB $L_{E,\ 24h}$: 189 dB	L_{pk}: 166-175 dB

Table 6-6: Noise exposure criteria (impulsive sounds) for fish

Hearing Group	Non-recoverable injury / potential mortal injury (Ref. 192)	Recoverable Injury (Ref. 192)	TTS onset thresholds (received level) (Ref. 192)
Fish without swim bladders	L_{pk}: 213 dB $L_{E,\ 24h}$: 219 dB	L_{pk}: 213 dB $L_{E,\ 24h}$: 216 dB	$L_{E,\ 24h}$: 186 dB
Fish with swim bladders	L_{pk}: 207 dB $L_{E,\ 24h}$: 207 dB	L_{pk}: 207 dB $L_{E,\ 24h}$: 203 dB	$L_{E,\ 24h}$: 186 dB

Impulsive sound (IMR acoustic surveys)

Marine Mammals

Behavioural disturbance

Modelling undertaken by Zykov (Ref. 193) indicates that sound levels associated with the site survey would exceed the behavioural response noise exposure criteria of 160 dB re 1 µPa (Table 6-4) within 290 m of the Vessel.

Within the OA, both mid-frequency cetaceans (e.g., Spotted Bottlenose Dolphin, Killer and Sperm whales) and low-frequency cetaceans (e.g., Blue, Brydes, Fin, Humpback and Sei whales) have the potential to be present.

If migrating cetaceans were present, CAPL does not expect that exposure to sound levels from the site survey would result in a significant change to migration behaviours or displace species outside of the BIA given the limited exposure (within 290 m) above the behaviour impact thresholds and broad spatial area associated with intersecting BIAs.

Furthermore, given the nature of any site survey (limited to one-two days) and as marine mammal species are expected to display transient (not sedentary) behaviours within the EMBA, duration of exposure (even to levels above the impact threshold) would be very limited. As such, the only potential impacts expected would be short-term behavioural effects to individuals, which were evaluated as Minor (5).

TTS and PTS

Modelling undertaken by Zykov (Ref. 193) indicates that sound levels associated with the site survey would may exceed the TTS and PTS noise exposure criteria of 168 dB re 1 µPa^2.s and 183 dB re 1 µPa^2.s respectively (Table 6-4) within 20 m of the source. Further to this, Zykov (Ref. 193) indicates that SPL levels of 208 dB re 1 µPa would only occur within 20 m of the source.

On this basis, neither TTS or PTS is not expected to occur given that, to exceed the TTS and PTS threshold levels, marine mammals would need to remain within 20 m of the vessel over a 24-hour period. Further to this, the duration of the activity is limited to one-two days, consequently, TTS and PTS effects associated with the site survey has not been considered further.

Turtles

Behavioural disturbance

Modelling undertaken by Zykov (Ref. 193) indicates that sound levels associated with a site survey over sandy substrate would likely exceed the behavioural response noise exposure criteria of 166 dB re 1 µPa (Table 6-5) within 290 m of the Vessel.

On the basis that only transient individual turtles are expected to be encountered within the OA (refer to continuous assessment) any behavioural response would likely be limited to a small number of individuals. Consequently, given the potential for short-term effects to species, the consequence was ranked as Minor (5).

TTS and PTS

Modelling undertaken by Zykov (Ref. 193) indicates that sound levels associated with a site survey over sandy substrate would likely exceed the TTS and PTS exposure criteria of 189 dB re 1 µPa^2.s and 204 dB re 1 µPa^2.s respectively (Table 6-5) within 20 m of the source. Further to this, SPL is not expected to be above TTS or PTS onset threshold criteria

(>226 dB re 1 µPa) given the source level (~215–220 dB re 1 µPa @ 1m) is likely below which these impacts will occur. On this basis, neither TTS or PTS is not expected to occur given that, to exceed the cumulative TTS and PTS threshold levels, turtles would need to remain within 20 m of the vessel over a 24-hour period. Further to this, the duration of the activity is limited to one-two days, consequently, TTS and PTS effects associated with the site survey has not been considered further. **<u>Fish</u>** *Behavioural disturbance* In lieu of specific behavioural noise exposure criteria for fish species, CAPL applied the most conservative noise exposure criteria for Fish being 158 dB re 1 µPa (Table 6-6) to inform the evaluation for this potential impact. Modelling undertaken by Zykov (Ref. 193) indicates that sound levels associated with the site survey would exceed the behavioural response noise exposure criteria within ~290 m of the source. Behavioural impacts are expected to be limited to an initial startle reaction before behaviours return to normal or result in fish moving away from the area (Ref. 194). Although both Pelagic and Demersal fish species are likely to be present within the affect area, demersal species that may reside around existing subsea infrastructure are likely to be most affected by this activity. However, as site surveys covered under this EP are limited to one-two days, and as the survey is conducted across the entire field, any species that move away from the area are likely to return once sound levels return to normal. As such, any potential impacts are expected to be limited, with short-term effects to species, and were ranked as Minor (5). *TTS, recoverable injuries and non-recoverable injuries* Modelling undertaken by Zykov (Ref. 193) indicates that any exceedance of the TSS, recoverable injury and non-recoverable injury exposure criteria of 186 dB re 1 µPa^2.s (for fish with and without swim bladders), 203 dB re 1 µPa^2.s and 207 dB re 1 µPa^2.s (both for fish with swim bladders) (Table 6-6) would be limited to within 20 m of the source. For TTS and more severe impacts to occur, fish species would need to be exposed to sound levels within close proximity (<20 m) of the source over a 24-hour period. Given common behavioural responses in fish such as c-startle reaction and avoidance, any exposure to SPL or SEL levels are not expected to occur as individuals would be expected to avoid the area prior to exceeding noise exposure criteria. Given the nature of the activity and as behavioural responses are likely to prevent exceedance of criteria, TTS and more severe impacts to fish are not considered further.	
ALARP decision context justification	
Offshore acoustic surveys are commonplace and well-practised nationally and internationally. The application of control measures to manage impacts and risks arising from this aspect are well defined, understood by the industry, and are considered standard industry practice. During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity. Although some species that are known to be sensitive to underwater sound have the potential to be exposed to underwater noise above exposure criteria during these activities, the impacts and risks arising from underwater sound emissions are considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans	The requirements to manage interactions between vessels and cetaceans are detailed in the EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans. These regulations describe strategies to ensure whales are not harmed during offshore interactions with people. By implementing these control measures and managing interactions with cetaceans near the vessels or any site surveys, the potential impacts from underwater sound are limited.
Biodiversity Conservation Regulations 2018	The requirements to manage interactions with marine fauna (including cetaceans, Whale Sharks, and Dugongs) and relevant separation distances are detailed in the WA Biodiversity Conservation Regulations 2018.

	By implementing these control measures and managing interactions with marine fauna near the vessels or any site surveys, the potential impacts from underwater sound are limited.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Baleen whales may exhibit behavioural avoidance when sound levels are at or above 160 dB re 1 µPa (Ref. 189). Baleen whales display a gradation of behavioural responses to pulsed sound, suggesting that acoustic discharges are audible to whales at considerable distances from the source. As described above, other species such as turtles and fish are expected to initially practice avoidance behaviours in response to sound emissions, and thus the likelihood of underwater sound from these activities resulting in longer-term impact is very unlikely (Ref. 194; Ref. 196). Although localised and temporary behaviour disturbance may occur, it is unlikely that this would result in any impact to a sensitive life stage of the fauna identified. Consequently CAPL consider the likelihood of the consequence occurring as being Rare (6).	
Risk level	Very ow (10)	
Acceptability summary		
Principles of ESD	The impacts and risks associated with this aspect are limited to localised, short-term behavioural changes. On the assumption that this potential impact occurs during a sensitive life stage, CAPL would not expect these activities to affect migration, or foraging behaviours, nor impact on individuals or the wider population. As such, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered applicable for this aspect include: • EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans • Biodiversity Conservation Regulations 2018 • *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • Conservation Advice *Megaptera novaeangliae* Humpback Whale (Ref. 98) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that underwater sound is listed as a threat to protected matters under documents made or implemented under the EPBC Act,	

	CAPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) specifies the following relevant action: • anthropogenic noise in BIAs will be managed such that any Blue Whale continues to utilise the area without injury, and is not displaced from a foraging area. No other specific relevant actions were identified within other documents implemented under the EPBC Act. The OA does not intersect with a foraging BIA for the Pygmy Blue Whale (Table 4-2). The nearest foraging BIA occurs ~105 km southwest of the OA, offshore from North West Cape; and as such is not exposed to underwater sound emissions resulting from activities under this EP. Therefore, CAPL has defined an acceptable level of impact as no injury to marine fauna.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
No injury to marine fauna from underwater sound emissions from petroleum activities	**EPBC Regulations 2000 and Biodiversity Conservation Regulations 2018** Vessels will implement caution and no approach zones, where practicable: • caution Zone (300 m either side of whales and 150 m either side of dolphins)– vessels must operate at ≤6 knots within this zone, maximum of three vessels within zone, and vessels should not enter if a calf is present • no approach zone (300 m to the front and rear of whales and 100 m either side; 300 m for whale calves; 150 m to front and rear of dolphins and 50 m either side; 100 m from dugongs; 30 m from whale sharks)–vessels should not enter this zone, and should not wait in front of the direction of travel or an animal or pod, or follow directly behind.	Induction materials include relevant marine fauna caution and no approach zone requirements Training records confirm offshore personnel involved in IMR activities have completed the induction

6.3.1.3 Planned discharges—Subsea operations

Source			
Activities identified as having the potential to result in planned subsea operational discharges are: • subsea IMR operations within the OA. The types of planned subsea operational discharges include small volumes of control fluids, hydraulic fluids, MEG, acid-water mix, preservation fluids, chemical dye, scale inhibitor, production fluids, and chemically treated potable water.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Planned IMR discharges may result in: • localised and temporary reduction in water quality.	6	A change in ambient water quality may result in: • indirect impacts to fauna arising from chemical toxicity.	6

Consequence evaluation
Localised and temporary reduction in water quality The release of minor quantities of MEG, production fluids, acid-water mix, and control fluids during IMR activities may result in a localised and temporary reduction in water quality around the discharge point. Discharge of small volumes of these fluids are predicted to disperse and dilute rapidly while floating rapidly towards the surface. The spatial extent is likely to be limited to the water column, and only in a range of metres from the discharge point. IMR discharges along the trunkline, where no maintenance activities are planned, are expected to be limited to typical minor hydraulic releases from ROVs during routine inspections and potentially minor discharges of acid-water mix, if required to remove calcareous marine growth from the single SSIV located ~100 m downstream of the platform prior to pigging. A typical acid–water mix discharge may comprise 20 L, however, a 200 L discharge (representing a more conservative estimate), would be expected to quickly dilute and neutralise as it reacts with the calcareous material being removed from the subsea infrastructure. Maintenance activities are planned only for subsea infrastructure upstream of the platform. Depending on the location along the hydrocarbon system that the IMR activity occurs, environmental values and sensitivities that may be present in the vicinity of water quality changes include fish communities (ancient coastline and continental slope) and ridgeline habitats. Any discharges during IMR activities are expected to result in limited environmental impacts. As subsea discharges are highly influenced by natural dispersion and dilution processes, the extent of exposure is most influenced by the volume of the release. Consequently, the planned discharges are expected to result in a limited environmental impact, and the consequence level was determined as Incidental (6).
Potential chemical toxicity As described above, these discharges are expected to result in temporary reductions in water quality within the immediate surroundings of the release location. The extent of this water quality reduction is limited to around the subsea infrastructure. The particular values and sensitivities within the OA identified as having the potential to be exposed to these discharges are: • ancient coastline at 125 m depth contour (KEF) • continental slope demersal fish communities (KEF) • commercial fisheries. Although these KEFs have been identified as having the potential to be exposed, as described in Section 4.3.5, surveys indicate that the seabed in the OA around the subsea infrastructure such as flowlines and drill centres, mostly comprises unvegetated, soft, and unconsolidated sediments with a low but varying degree of benthic invertebrate habitation. Given that biologically important habitats tend to be found in areas of rocky escarpment rather than soft sediments (Ref. 28), exposure to habitats comprising high levels of diversity are not expected. The *North-West Marine Bioregional Plan* (Ref. 28) does not identify toxicity or chemical pollution/contaminants as a key threat to the continental slope demersal fish communities KEF. Given the rapid dilution and dispersion conditions, low bioaccumulation potential and the high biodegradability of the control fluids, and intermittent frequency of discharges, bioaccumulation in the receiving environment and sublethal impacts are expected to be limited. Consequently, the release of subsea discharges are expected to result in a limited environmental impact, and the consequence level was determined as Incidental (6).
ALARP decision context justification
Subsea discharges associated with IMR activities are commonplace and well-practiced within the industry. The control measures to manage the risk associated with these planned discharges are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL During stakeholder consultation, no objections or claims were raised regarding planned discharges from subsea IMR activities arising from the activity. The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source		
Control measure	**Source**	
Hazardous materials selection process	As part of the hazardous materials selection process, hazardous materials that will be discharged to the environment will undergo a detailed environmental assessment, as per CAPL's *Hazardous Materials Management Procedure* (Ref. 55)	
Activity-specific HIRA	The HIRA will include HSE Specialist participation to identify and assess potential environmental impacts and risks associated with the specific maintenance or repair campaign proposed. The HIRA will consider relevant information, which may include: • proximity to potentially sensitive environmental receptors • other known activities and/or impacts that have occurred at that location • material minimisation • alternative materials • alternative execution methodologies • learnings from previous comparable IMR activities/campaigns. Where the HIRA identifies that risks and impacts are potentially greater than those assessed in this EP, the management of change process will be triggered (Section 8.3.2.2).	
IMR work procedures	Activity specific work procedures are developed and address HIRA findings, including any additional controls identified for implementation.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Given the nature and scale of this activity, and with standard control measures in place, it is considered Rare (6) that this discharge would result in any impact to the ecological function of the particular values and sensitivities present within the OA.	
Risk level	Very low (10).	
Determination of acceptability		
Principles of ESD	The potential impacts and risks associated with this aspect is limited to a short-term direct reduction in water quality in a localised area, which is not considered as having the potential to affect biological diversity and ecological integrity. Accordingly, the consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant for this aspect.	
Internal context	This CAPL environmental performance standard / procedure was deemed relevant for this aspect: • *Hazardous Materials Management Procedure* (Ref. 55).	
External context	During stakeholder consultation, no objections or claims were raised regarding discharges arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not	

<table>
<tr><td></td><td colspan="2">inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.</td></tr>
<tr><th>Environmental performance outcome</th><th>Performance standard / Control measure</th><th>Measurement criteria</th></tr>
<tr><td rowspan="3">Reduce the risk of impacts to marine habitats and fauna from subsea discharges during petroleum activities</td><td>Hazardous materials selection process
Subsea fluids planned for discharge are subject to the hazardous materials selection process as per the CAPL Hazardous Materials Management Procedure</td><td>Hazardous materials selection process assessment records (or similar)</td></tr>
<tr><td>IMR work procedures
IMR activity specific work procedures developed and implemented</td><td>Records show that activity specific work procedures are developed for each IMR activity and address HIRA findings, including any additional controls identified for implementation</td></tr>
<tr><td>Activity-specific HIRA
Activity-specific HIRA undertaken prior to maintenance or repair activity commencing</td><td>Records show that activity-specific HIRA undertaken prior to maintenance or repair activity commencing</td></tr>
</table>

6.3.1.4 Unplanned release—Loss of containment

<table>
<tr><th colspan="4">Source</th></tr>
<tr><td colspan="4">Activities identified as having the potential to result in a minor loss of containment (LOC) event:
• subsea IMR operations within the OA.
Based on the activities described in this EP, the following potential minor LOC scenarios were identified:
• mechanical failure/damage of ROV/AUV resulting in a loss of hydraulic fluid[1].
[1] Offshore single point failure of the ROV hydraulic systems could result in hydraulic fluid release to the marine environment, ~<1 m^3.</td></tr>
<tr><th colspan="4">Potential Impacts and Risks</th></tr>
<tr><th>Impacts</th><th>C</th><th>Risks</th><th>C</th></tr>
<tr><td>N/A</td><td>-</td><td>Unplanned release of hazardous material to the environment may result in:
• indirect impacts to fauna arising from chemical toxicity</td><td>6</td></tr>
<tr><th colspan="4">Consequence Evaluation</th></tr>
<tr><td colspan="4">As the potential release volumes are small (~1 m3), the extent of water quality changes is only likely to be a few metres in the water column around the release, prior to dispersion and dilution. The potential spills from an ROV performing IMR activities would have negligible changes to water quality, with the no identified potential consequences to environmental values.
Depending on the location of the IMR activities along the hydrocarbon system, the environmental values in the vicinity can include fish communities. Interaction of fish immediately after the fluid release has the worst-case potential of acute effects on individuals.
Because a release would disperse and dilute rapidly, the potential consequence is limited to a short time after the release. The potential consequences to marine fauna from of a change of water quality from an ROV release could be limited. No adverse effects to fish communities are predicted. Therefore, the consequence was ranked as Incidental (6).</td></tr>
</table>

ALARP Decision Context Justification
Offshore operations including IMR and vessel operations are commonplace and well-practiced industry activities. The control measures to manage the risk associated with LOC scenarios from these activities are well defined via legislative requirements that are considered standard industry practice. There is a good understanding of potential spill sources, and the control measures required to managed these are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding unplanned discharges from subsea IMR activities arising from the activity. The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source	
Control measure	**Source**
None identified	No controls have been applied for these impacts and risks as subsea IMR minor LOC management is a lower-order impact and risk; no industry standard controls are required for offshore minor LOC events where minimal impacts and risks are present.

Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A

Likelihood and risk level summary	
Likelihood	The likelihood that a minor LOC event results in an Incidental (6) consequence was determined to be Remote (5). With the control measures in place, it was considered unlikely that a minor LOC event associated with this activity would occur, and even more unlikely that such an event would impact any of the identified values and sensitivities.
Risk level	Very low (10).

Determination of acceptability	
Principles of ESD	The risks associated with this aspect are expected to have a limited environmental impact, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no additional evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant for this aspect.
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding minor LOC management arising from the activity.
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
N/A	N/A	N/A

6.3.2 Onshore IMR

6.3.2.1 Physical presence—Terrestrial fauna

<table>
<tr><th colspan="4">Source</th></tr>
<tr><td colspan="4">Activities identified as having the potential to result in an interaction with terrestrial fauna are:
• temporary presence of vehicles within the OA during IMR activities
• excavations left open overnight.</td></tr>
<tr><th colspan="4">Potential Impacts and Risks</th></tr>
<tr><th>Impacts</th><th>C</th><th>Risks</th><th>C</th></tr>
<tr><td>N/A</td><td>-</td><td>Unplanned interactions with terrestrial fauna may result in:
• injury or death of terrestrial fauna.</td><td>5</td></tr>
<tr><th colspan="4">Consequence Evaluation</th></tr>
<tr><td colspan="4">Although no significant habitat for terrestrial fauna is known to occur within the OA, mobile fauna have the potential to be encountered.
Risks of fauna strike from vehicles are greatest to mammal species between dusk and dawn when these species are most active and visibility is low (Ref. 106). However, it is known that fauna mortalities caused by road traffic do not exert significant pressure on fauna at a population level (Ref. 106), thus any unplanned incidents of injury or fatality caused as a part of this activity are expected to result in impacts at an individual level only and not have population effects.
Excavation associated with the petroleum activity relates to maintenance and repairs and is expected to be infrequent. However, if excavation is undertaken and left open overnight, there is a potential for fauna to be attracted for shelter and fauna entrapment, injury, or increased predation resulting in mortality could occur (Ref. 104; Ref. 105). Any fauna trapping within an open trench is expected to impact at individual and not population levels.
Based upon the nature of the activities covered under this EP, any fauna incidents (if any) are expected to be low in numbers. As such, the consequence has been ranked as Minor (5).</td></tr>
<tr><th colspan="4">ALARP Decision Context Justification</th></tr>
<tr><td colspan="4">The pathways for interacting with fauna are well understood. Management measures for these hazards are also well understood and implemented by the industry.
During stakeholder consultation, no objections or claims were raised regarding terrestrial fauna impacts arising from the activities.
The risks associated with physical interaction with terrestrial fauna are considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.</td></tr>
<tr><th colspan="4">Good practice control measures and source</th></tr>
<tr><th>Control measure</th><th colspan="3">Source</th></tr>
<tr><td>Traffic management</td><td colspan="3">All light vehicles have an IVMS that tracks vehicle speed.</td></tr>
<tr><td>Fauna management</td><td colspan="3">The implementation of fauna exclusion and egress management measures where fauna traps are present are considered good practice to reduce likelihood of entrapment, whilst providing means of egress if the initial exclusionary barriers fail.
Specifically, CAPL will consider egress controls and physical barriers will be implemented, where required, in excavations left open overnight. Any fauna found, will be removed by a trained fauna handler.</td></tr>
<tr><th colspan="4">Additional control measures and cost benefit analysis</th></tr>
<tr><th>Control measure</th><th>Benefit</th><th colspan="2">Cost</th></tr>
<tr><td>N/A</td><td>N/A</td><td colspan="2">N/A</td></tr>
</table>

Likelihood and risk level summary		
Likelihood	Given the amount of vehicle and excavation activity planned within the onshore ROW, and with the control measures in place, the likelihood of the activities causing a fauna death or injury is Remote (5).	
Risk level	Very low (9).	
Determination of acceptability		
Principles of ESD	The potential impact associated with this aspect is limited to individuals and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant for this aspect.	
Internal context	CAPLs environmental performance standards / procedures considered relevant to this aspect include: • *Wheatstone Downstream Green Guide Environmental Reference Manual* (Ref. 107).	
External context	During stakeholder consultation, no objections or claims were raised regarding this aspect.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of injury or mortality to terrestrial fauna from petroleum activities	**Traffic management** An IVMS will be installed in light vehicles to manage vehicle speeds within the ROW	Records show an IVMS is in place to manage vehicle speeds within the ROW.
	Fauna management Fauna exclusion measures will be considered for any excavations deeper than 500 mm that is planned to be open for greater than 12 hours. Suitable exclusion measures may include fauna fencing, lids, or covers. Where complete exclusion is not practicable for such excavations, fauna exit ramps, scramble nets, or other egress measures will be considered.	Records confirm fauna exclusion or fauna egress measures have been considered and approved by CAPL for activities requiring excavation deeper than 500 mm that is planned to be open for greater than 12 hours.
	Fauna management Fauna handling of injured fauna, where required, is undertaken by a trained fauna handler.	CAPL Wildlife Database records confirm fauna interactions were conducted by trained fauna handlers.

6.3.2.2 Ground disturbance

Onshore IMR activities may include the environmental aspect of ground disturbance. Very rarely, onshore IMR activities may require excavation around the pipeline, which would only be performed in the unlikely event that closer inspections are needed, or to support repair activities (e.g., pipe repair). The ground above and adjacent to the pipeline has already been disturbed through previous construction activities; therefore, no credible hazards to the environment are possible.

6.3.2.3 Dust emissions

Onshore IMR activities may include the environmental aspect of dust, as personnel and vehicle movements are required along the onshore pipeline section. The short (~1 km) onshore pipeline section lays in between berms, is backfilled with soil, and vegetation is absent or kept sparse to enable inspections. The pipeline embankment slopes are protected by rock.

The exposed onshore area is short and narrow. Vegetation near the pipeline is common in the wider region and is not unique or particularly sensitive to windblown dust. Dust levels are not expected to be above natural levels in the area. Rainfall during the wet season removes dust on leaf and stem surfaces. A long-term monitoring program that investigated impacts of dust on vegetation for a significant development in the Pilbara over a 5-year period, where significantly higher volumes of vehicles (heavy and light) and earthworks were present, determined that no adverse impacts occurred to plant health or vegetation communities as a result of construction dust loads (Ref. 198).

No change or effect on vegetation health beyond natural variation is expected from dust and therefore dust is not a credible hazard to the environment.

6.3.2.4 Light emissions

Onshore IMR activities may include the environmental aspect of artificial lighting. IMR night works are not planned; however, in exceptional circumstances night works may be required for short durations (depending on the IMR requirement), with the use of temporary lighting limited to only that necessary to illuminate safe work areas. In the unlikely event that IMR lighting is required, the lights would be limited to specific areas of the trunkline, with minimal light glow, and only used for short periods. The nearest turtle nesting beach is several kilometres from the area, and foredunes are expected to partly obscure the minimal light glow. Given the negligible generation of artificial light, there are no credible hazards to fauna.

6.3.2.5 Non-indigenous species

Source			
Activities identified as having the potential to result in the introduction of a non-indigenous species (NIS) are: • presence of NIS on vehicles (or other plant/equipment) undertaking IMR activities within the OA.			
Potential Impacts and Risks			
Impacts	**C**	**Risks**	**C**
N/A	-	An introduction or spreading of a NIS may result in:	5

		• displacement of, or compete with, native species, ecosystems or communities.	

Consequence Evaluation
If a NIS is translocated to the OA and subsequently become established, they may out-compete native plants, leading to loss of native flora species, changes in the structure and composition of vegetation communities, and changes in flora diversity. Once established and if not controlled, further proliferation of weeds can occur, which can be difficult to eradicate. However, the licence area (as illustrated in Figure 2-2) is primarily exposed soil with minimal vegetation. As such, the environmental impact of introducing a NIS, is expected to be minimal. Therefore, the potential consequence of the introduction of a NIS resulting in damage to local onshore habitats and terrestrial vegetation is ranked as minor (5).
ALARP Decision Context Justification
The pathways for the introduction and spread of NIS are well understood, with ground disturbing activities common for onshore oil and gas activities in WA. Management measures for these hazards are also well understood and implemented by the industry. During stakeholder consultation, no objections or claims were raised regarding spills arising from the activities. The risks associated with the introduction of new weeds are considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source	
Control measure	**Source**
Weed hygiene inspections	Vehicles comply with weed hygiene requirements for vehicle movement detailed in *Wheatstone Downstream Green Guide Environmental Reference Manual* (Ref. 107), specifically the vehicles and plant working off existing cleared areas and roads are weed-free and have a weed inspection certificate prior to arriving onsite. Inspecting vehicles and machinery for weeds is a standard practice for weed prevention. Inspection and monitoring of the licence area for new or declared weed species will enable early detection and removal. This will occur every two years (in accordance with Condition 16-1(iii) of MS 873).

Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A

Likelihood and risk level summary	
Likelihood	Given the size of the onshore area and that most of the site will be covered by hardstand (roads), there is a limited area of exposed soil with the potential to become colonised by weeds. With the administrative controls in place, the likelihood of introducing weeds resulting in damage to habitats is ranked as rare (6).
Risk level	Very low (10).
Determination of acceptability	
Principles of ESD	The potential impact associated with this aspect is limited environmental affects and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental	No environmental legislation or other requirements were deemed relevant for this aspect.

legislation and other requirements		
Internal context	CAPLs environmental performance standards / procedures considered relevant to this aspect include: • *Wheatstone Downstream Green Guide Environmental Reference Manual* (Ref. 107).	
External context	During stakeholder consultation, no objections or claims were raised regarding NISs arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the terrestrial environment by preventing introduction of NIS during petroleum activities	**Weed hygiene inspections** Vehicles comply with weed hygiene requirements for vehicle movement detailed in *Wheatstone Downstream Green Guide Environmental Reference Manual*, specifically that vehicles and& plant working off existing cleared areas and roads are to be weed free and have a weed inspection certificate prior to arriving onsite	Completed weed hygiene checklists
	Weed hygiene inspections Biennial monitoring and removal of declared or new weed species in the licence area	Records show inspection and removal of declared or new weed species in the licence area

6.3.2.6 Unplanned release—Loss of containment

Source			
Activities identified as having the potential to result in a minor loss of containment (LOC) event: • IMR operations within the OA. Based on the activities described in this EP, the following potential minor LOC scenarios were identified: • mechanical failure/damage of hazardous materials storage resulting in a loss of diesel or other fluid[1]. [1] *Onshore LOC could result in diesel or chemicals being released to the onshore environment, ~<1 m^3 based on the predicted volumes used for IMR activities..*			
Potential Impacts and Risks			
Impacts	**C**	**Risks**	**C**
N/a	-	Unplanned release of hazardous material to the onshore environment may result in: • soil and groundwater contamination	6
Consequence Evaluation			
A minor LOC of diesel (or other fluids) onshore resulting in a <1 m^3 is the largest spill scenarios associated with onshore IMR activities. Given the onshore section of trunkline is covered by soil, the spatial extent of an onshore release would be limited to a relatively confined area around the trunkline, with most of the fluids likely to			

soak into the surrounding soil. Based upon Grimaz et al. (Ref. 81) it is anticipated that a release of 1 m^3 could result in up to ~<0.5 m penetration depth into the soil profile. As such, no exposure to groundwater is expected to occur from minor LOC events. No specific values or sensitivities (e.g., TECs) are present within the onshore OA. Given the limited spatial exposure, buried trunkline, and the previously disturbed nature of the receiving environment, any potential impact from an onshore minor LOC event are expected to the limited. As such, the consequence level was determined as Incidental (6).
ALARP Decision Context Justification
Onshore IMR operations are commonplace nationally and internationally. The source of spills arising from these activities is well understood, and control measures to manage the risk well defined via measures that are considered standard industry practice. During stakeholder consultation, no objections or claims were raised regarding minor LOC management arising from the activity. The risks associated with an accidental release arising from IMR activities are considered lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
Hazardous materials/ dangerous goods storage and handling	Minor quantities of flammable and combustible liquids may be required during IMR activities. Inspections ensure storage and handling of flammable and combustible liquids meet applicable standards. Onshore storage and handling of flammable and combustible liquids in accordance with applicable standards (e.g., AS 1940-2004 The Storage and Handling of Flammable and Combustible Liquids).
Spill kits and drip trays	Spill kits will be provided to allow personnel to respond to minor leaks and spills and reduce the risk of spills/leaks reaching the environment. Drip trays are available to capture drips and leaks, where safe to do so.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	IMR activities are expected to be infrequent, with small volumes of diesel or other fluids potentially being released. With the controls in place, the likelihood of spills impacting soil and groundwater is ranked as Unlikely (4).
Risk level	Very low (9).

Determination of acceptability

Principles of ESD	The potential impact associated with this aspect is limited to temporary environmental affects and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant for this aspect.
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.
External context	During stakeholder consultation, no objections or claims were raised regarding LOC management arising from the activity.

Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**Hazardous materials/ dangerous goods storage and handling** IMR-related onshore storage and handling of flammable and combustible liquids shall be in accordance with AS 1940-2004 Section 2 – Minor Storage.	Records show onshore storage and handling of flammable and combustible liquids is in accordance with AS 1940-2004 Section 2 – Minor Storage
	Spill kits and drip trays Spill kits and drip trays are available for use (where hazardous materials/dangerous goods are stored within the ROW during onshore IMR).	Records show spill kits and drip trays are available for use (where hazardous materials/dangerous goods are stored within the ROW during onshore IMR).

6.4 Field Support

6.4.1 Physical presence—Other marine users

Source			
Activities identified as having the potential to result in an interaction with other marine users are: • temporary presence of vessels within the OA during IMR activities.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	Unplanned interactions with other marine uses may result in: • disruption to commercial shipping and fishing vessels.	6
Consequence evaluation			
The use of support vessels during IMR activities has the potential to result in a disruption to other marine users, including commercial shipping or fishing vessels. As identified in Section 4.4.1, one Commonwealth managed commercial fishery (North West Slope Trawl Fishery) has a management area that overlaps with the OA. The extent to which the OA overlaps this trawl fishery management area is <1%. Fishing activity within the Commonwealth trawl fisheries is restricted to waters >200 m water depth. The fishery also has only a small number of active permits (e.g., six within the 2017-2018 season [Ref. 1; appendix d]). As identified in Section 4.4.1, several State managed commercial fisheries (Mackerel, Onslow Prawn. Pilbara Crab, Pilbara Line, Pilbara Trap, Marine Aquarium, and Specimen Shell) have management areas and recent fishing activity that overlaps with the OA. However, fishing activity is relatively low with small numbers of vessels in operation (Figure 4-18 to Figure 4-24). The OA is also located outside major shipping lanes and commercial marine traffic density within the OA is low (Figure 4-25) indicating that the IMR activity is not expected to affect major shipping channels or commercial shipping operators. In summary, the physical presence of support vessels undertaking activities within the OA is not expected to cause significant impacts to commercial fishing and shipping vessels, and the consequences are considered limited in nature. Therefore, the potential disturbance/disruption impacts to other marine users from the physical presence of the platform is ranked as Incidental 6).			
ALARP decision context justification			
Offshore commercial vessel operations are commonplace and well-practised nationally and internationally. The control measures to manage the risks associated with unplanned interactions with other marine users are well defined and understood by the industry. During stakeholder consultation, no objections or claims were raised regarding disturbance/disruption to other marine users arising from the petroleum activity. The risks arising from the physical presence of vessels are considered lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.			

Good practice control measures and source	
Control measure	**Source**
Stakeholder engagement	Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information. Communicating the activity details, location, and presence of vessels to other marine users ensures they are informed and aware, thereby reducing the risk of unplanned interactions.
Maritime safety information	Maritime safety information, such as AUSCOAST navigational warnings, are issued by the Joint Rescue Coordination Centre (JRCC) Australia, part of AMSA. Under the *Navigation Act 2012*, the AHO is also responsible for maintaining and disseminating navigational charts and publications, including providing safety-critical information to mariners (including any

	change to prohibited/restricted areas, obstructions to surface navigation, etc.) via the Notice to Mariners system. Notice to Mariners can be permanent or temporary notifications. Where required for an IMR activities, AUSCOAST and/or Notice to Mariners will be issued; thus enabling other marine users to also safely plan their activities.	
Marine Safety Reliability and Efficiency (MSRE) process	CAPL's *ABU MSRE Corporate OE Process* (Ref. 53) ensures that various legislative requirements are met. These include: • crew meet the minimum standards for safely operating a vessel, including watchkeeping requirements • navigation, radar equipment, and lighting meets industry standards. These requirements will ensure that direct vessel radio contact is available to other marine users operating in this area to enable ease of communication in highlighting risks and nearby exclusion zones.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Due to the nature and scale of vessel activities within the scope of this EP, the slow-moving nature of vessels within the OA, the likelihood of interaction with other marine users or a vessel collision with marine fauna is considered low. Based upon previous experience, in the OA, CAPL consider that the likelihood of the consequence occurring is Remote (5).	
Risk level	Very low (10)	
Determination of acceptability		
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing individual fauna death / incidental disruption to other marine users, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Commonwealth *Navigation Act 2012*.	
Internal context	These CAPL environmental performance standards / procedures were deemed relevant for this aspect: • MSRE process (Ref. 53)	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with other marine users arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
Reduce the risk of impacts to other marine users from petroleum activities	**Stakeholder engagement** Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information	Stakeholder consultation records
	Maritime safety information Where required, Notice to Mariners and/or AUSCOAST warnings are issued prior to commencing offshore IMR work	Record of lodgement of notification to relevant agency
	MSRE process Vessels will meet the crew competency, navigation equipment, and radar requirements of the MSRE process	Records indicate that vessels meet the crew competency, navigation equipment, and radar requirements of the MSRE process

6.4.2 Physical presence—Marine fauna

Source			
Activities identified as having the potential to result in an interaction with marine fauna are: • temporary presence of vessels within the OA during IMR activities.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	Unplanned interactions with marine fauna may result in: • injury or death of marine fauna.	6
Consequence evaluation			

Surface-dwelling fauna are the species most at risk from this aspect and thus are the focus of this evaluation. As identified in Section 4.3, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. Several BIAs also overlap with the OA, including:

- Pygmy Blue Whale (migration, distribution)
- Humpback Whale (migration)
- Whale Shark (foraging)
- Flatback Turtle (internesting, nesting)
- Hawksbill Turtle (internesting).

The *Recovery Plan for Marine Turtles in Australia* (Ref. 93) identifies vessel disturbance as a key threat; however, it also notes that this is particularly an issue in shallow coastal foraging habitats. Given vessel activity in shallow water is limited to intermittent inspection activities and unplanned repair activities, vessel disturbance to turtles is not evaluated further, and the focus of this evaluation is on cetaceans and sharks, as they provide a representative case to enable an indicative consequence evaluation to be undertaken.

A review of the documents made or implemented under the EPBC Act for all shark and cetacean species likely to be present within the OA (i.e., Whale Sharks [Ref. 96], Fin Whale [Ref. 97], Humpback Whale [Ref. 98], Sei Whale [Ref. 99], Blue Whale [Ref. 100] and Southern Right Whale [Ref. 197]) indicates that either vessel disturbance or interaction (such as collisions) as a key threat to the recovery of the species.

For all cetacean species likely to be present within the OA, these documents indicate that management actions are limited to reporting of incidents via the national database (refer to the

identified control measures) and ensuring that the risk of vessel strike is assessed (see the following text below). Cetaceans are naturally inquisitive marine mammals that are often attracted to offshore vessels and facilities. The reaction of whales to the approach of a vessel is quite variable. Some species remain motionless when near a vessel, while others are curious and often approach vessels that have stopped or are slow moving, although they generally do not approach, and sometimes avoid, faster-moving vessels (Ref. 199). Both the *Conservation Management Plan for the Blue* Whale 2015–2025 (Ref. 99) and *Conservation Advice for the Humpback Whale* (Ref. 97) indicate that although all forms of vessels can collide with whales, severe or lethal injuries are more likely to occur by larger or faster vessels. Laist *et al.* (Ref. 200) found that larger vessels with reduced manoeuvrability moving >10 knots may cause fatal or severe injuries to cetaceans, with the most severe injuries caused by vessels travelling faster than 14 knots. Given that vessels that will be stationary or slow moving whilst undertaking the activities within the scope of this EP, any interaction with marine fauna would not be expected to cause severe injuries. There have been recorded instances of cetacean deaths in Australian waters (e.g. a Bryde's Whale in Bass Strait in 1992) (Ref. 201), although the data indicates deaths are more likely to be associated with container ships and fast ferries. Mackay *et al.* (Ref. 202) report that four fatal and three non-fatal collisions with Southern Right Whales were recorded in Australian waters between 1950 and 2006, with one fatal and one non-fatal collision reported between 2007 and 2014. A review of the documents made or implemented under the EPBC Act for Whale Sharks indicate that management actions should consider minimising offshore developments and transit time of large vessels in areas close to marine features likely to correlate with whale shark aggregations (Ningaloo Reef, Christmas Island and the Coral Sea). On the basis that vessels activities are minimised to the smallest practicable extent (as also driven by economic considerations), the high-density foraging BIA is not located within the OA, and given that the nature and scale of IMR activities over the course of this EP are limited the activity is considered to be consistent with all relevant management actions. Whale Sharks are known to spend considerable time close to the surface increasing their vulnerability to vessel strike. Whale sharks tagged off Western Australia (Ref. 203, Ref. 204) spent ~25% of their time less than 2 metres from the surface and greater than 40% of their time in the upper 15m of the water columns. Spending such considerable time within the 15 m of the surface leaves them vulnerable to collision with smaller vessels as well as larger commercial vessels that have drafts greater than 20 m below the surface. A search of the National Database did not identify any previous incidences of vessel strikes with Whale Sharks, indicating that although the risk is possible, previous events are limited in frequency. Although the OA overlaps the Whale Shark foraging BIA, vessels will be stationary or slow-moving whilst implementing the activities within the scope of this EP. Consequently, incidences of fauna strike are not expected considering the slow vessel speed, the low number of vessels within the OA at any one time and the very low (cetaceans) and no (whale sharks) reports of fauna strikes. If a fauna strike occurred and resulted in death, it is not expected to have a detrimental effect on the overall population; this event would result in a limited environmental impact (individual impacts); thus, fauna strike is evaluated as having the potential to result in an Incidental (6) consequence.
ALARP decision context justification
Offshore commercial vessel operations are commonplace and well-practised nationally and internationally. The control measures to manage the risk associated with fauna strike are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity. The risks arising from the physical presence of vessels are considered lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.
Good practice control measures and source

Control measure	**Source**
EPBC Regulations 2000 – Part 8 Division 8.1 –	The requirements to manage interactions between vessels and cetaceans are detailed in the EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans. These regulations describe strategies

Interacting with cetaceans	to ensure whales are not harmed during offshore interactions with people. By implementing these control measures and managing interactions with cetaceans near the vessels or any site surveys, the potential impacts from underwater sound are limited.	
Biodiversity Conservation Regulations 2018	The requirements to manage interactions with marine fauna (including cetaceans, Whale Sharks, and Dugongs) and relevant separation distances are detailed in the WA Biodiversity Conservation Regulations 2018.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Due to the nature and scale of vessel activities within the scope of this EP, the slow-moving nature of vessels within the OA, and the limited area of operation, the likelihood of a vessel collision with marine fauna is considered low. Based upon previous experience, in the OA, CAPL consider that the likelihood of the consequence occurring is Remote (5).	
Risk level	Very low (10)	
Determination of acceptability		
Principles of ESD	The risks associated with this aspect are associated with unplanned interactions causing individual fauna death / incidental disruption to other marine users, which is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans • Biodiversity Conservation Regulations 2018 • *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • Conservation Advice *Megaptera novaeangliae* Humpback Whale (Ref. 98) • *Conservation Advice Balaenoptera borealis Sei Whale* (Ref. 99) • *Conservation Advice Balaenoptera physalus Fin Whale* (Ref. 97) • *Conservation Management Plan for the Southern Right Whale 2011-2021* (Ref. 197) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding interaction with marine fauna arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	

	However, given that vessel strike is listed as a threat to protected matters under documents made or implemented under the EPBC Act, CAPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The Conservation Advices for Blue Whales, Humpback Whales, Sei Whales, Fin , and Southern Right Whales (Ref. 100; Ref. 98; Ref. 99; Ref. 97; Ref. 197) all specify the following action: • ensure all vessel strike incidents are reported in the National Ship Strike Database. This action is incorporated into reporting requirements under this EP (Section 8.4).	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of injury or mortality to marine fauna from petroleum activities	**EPBC Regulations 2000 and Biodiversity Conservation Regulations 2018** Vessels will implement caution and no approach zones, where practicable: • caution Zone (300 m either side of whales and 150 m either side of dolphins)– vessels must operate at ≤6 knots within this zone, maximum of three vessels within zone, and vessels should not enter if a calf is present • no approach zone (300 m to the front and rear of whales and 100 m either side; 300 m for whale calves; 150 m to front and rear of dolphins and 50 m either side; 100 m from dugongs; 30 m from whale sharks)–vessels should not enter this zone, and should not wait in front of the direction of travel or an animal or pod, or follow directly behind.	Induction materials include relevant marine fauna caution and no approach zone requirements
		Training records confirm offshore personnel involved in IMR activities have completed the induction
		No incident reports of marine fauna strikes that are attributable to offshore IMR activities

6.4.3 Seabed disturbance

Source			
Activities identified as having the potential to result in seabed disturbance are: • vessel anchoring.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Seabed disturbance may result in: • alternation of marine habitats.	6	N/A	–
Consequence evaluation			
Although anchoring is not a routine activity, it has been carried through as a contingent activity in the event a different vessel is required onsite to conduct IMR activities, or anchoring is required within the OA due to a significant weather event. As detailed by NERA (Ref. 108), a vessel anchored within water depths greater than 70 m with a single anchor could result in a total disturbance area of up to 1,300 m^2. This indicative seabed disturbance area represents <1% of the OA. The particular values and sensitivities within the OA with the potential to be impacted by seabed disturbance include:			

• ancient coastline at 125 m depth contour (KEF) • continental slope demersal fish communities (KEF) • ridgeline habitat and associated communities. Although these values and sensitivities have been identified as having the potential to be impacted from vessel anchoring activities, any disturbance will be in close proximity of existing infrastructure. As this area has been historically disturbed, any additional disturbance is expected to have limited environmental impact. Given the nature of the receiving environment within the OA, undertaking rare and infrequent vessel anchoring activities is not expected to affect ecosystem function or connectivity of communities. As such, CAPL has ranked the consequence as Incidental (6).		
ALARP decision context justification		
Vessel anchoring is commonplace; the activities causing this aspect are practised nationally and internationally. The control measures to manage the impacts associated with seabed disturbance are well understood and implemented by the industry. During stakeholder consultation, no objections or claims were raised regarding seabed disturbance arising from the activity. The impacts associated with seabed disturbance are considered lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.		
Good practice control measures and source		
Control measure	**Source**	
MSRE process	CAPL's *ABU MSRE Corporate OE Process* (Ref. 53) ensures that various legislative requirements are met including that vessels will meet the crew competency, navigation equipment, and radar requirements.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	N/A	
Risk level	N/A	
Determination of acceptability		
Principles of ESD	The potential impact associated with this aspect is limited to localised short-term effects that are not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No environmental legislation or other requirements were deemed relevant for this aspect.	
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • MSRE process (Ref. 53).	
External context	During stakeholder consultation, no objections or claims were raised regarding seabed disturbance arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
Reduce the risk of impacts to complex habitats from petroleum activities	**MSRE process** Vessels will meet the crew competency, navigation equipment, and radar requirements of the MSRE process	Records indicate that vessels meet the crew competency, navigation equipment, and radar requirements of the MSRE process

6.4.4 Air emissions

Source			
Activities identified as having the potential to result in air emissions are: • combustion of marine fuel from vessels within the OA during IMR activities.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Air emissions may result in: • localised and temporary reduction in air quality.	6	N/A	-

Consequence evaluation

Modelling was undertaken for nitrogen dioxide (NO_2) emissions from MODU power generation for another offshore project (Ref. 215). NO_2 is the focus of the modelling because it is considered the main (non-greenhouse) atmospheric pollutant of concern, with larger predicted emission volumes compared to other pollutants, and has potential to impact on human health (as a proxy for environmental receptors). Results of this modelling indicate that on an hourly average, there is the potential for an increase in ambient NO_2 concentrations of 0.0005 ppm within 10 km of the emission source and an increase of <0.1 µg/m^3 (0.00005 ppm) in ambient NO_2 concentrations >40 km away.

The *National Environmental Protection (Ambient Air Quality) Measure* (NEPM) recommends that hourly exposure to NO_2 is <0.12 ppm with annual average exposure <0.03 ppm.

Given that referencing this modelling is considered overly conservative as the volume of fuel required for power generation is expected to be significantly less for support vessels when compared to MODU operations, and as the highest hourly averages (0.00039 ppm or 0.74 µg/m^3) were restricted to a distance ~5 km from the MODU (Ref. 215), exposures from vessel activities covered under this EP would be well below NEPM standards and thus any impacts were considered to be Incidental (6).

ALARP decision context justification

Offshore commercial vessel operations and subsequent air emissions arising from these activities are commonplace in offshore environments, both nationally and internationally. The control measures to manage the risk associated with atmospheric emissions are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL.

During stakeholder consultation, no objections or claims were raised regarding air emissions arising from the activity.

The impacts arising from atmospheric emissions constitute lower-order impacts (Table 5-3). As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
Reduced sulfur content fuel	Sulfur content of diesel/fuel oil complies with Marine Order 97 and Regulation 14 of MARPOL 73/78 Annex VI. Only low-sulfur (0.50 mass % concentration [m/m]) fuel oil will be used to minimise sulfur oxides (SO_x) emissions when available

Marine Order 97: Marine Pollution Prevention – Air Pollution	Prior to commencement of IMR activities, the MSRE process (Ref. 53) is used to verify that all vessels comply with Marine Order 97: Marine Pollution Prevention – Air Pollution (appropriate to vessel class) for emissions from combusting fuel, including: • Vessels will hold a valid International Air Pollution Prevention (IAPP) certificate and a current international energy efficiency (IEE) certificate • All vessels (as appropriate to vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI • Vessel engine nitrous oxides (NO_x) emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI.		
Additional control measures and cost benefit analysis			
Control measure	**Benefit**		**Cost**
N/A	N/A		N/A
Likelihood and risk level summary			
Likelihood	N/A		
Risk level	N/A		
Determination of acceptability			
Principles of ESD	The potential impact associated with this aspect is limited to a direct reduction in air quality for a localised area for a short time, which is not considered to have the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.		
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant to this aspect include: • Marine Order 97 • MARPOL 73/78		
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • MSRE process (Ref. 53).		
External context	During stakeholder consultation, no objections or claims were raised regarding air emissions arising from the activity.		
Defined acceptable level	These impacts are inherently acceptable as they are lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.		
Environmental performance outcome	**Performance standard / Control measure**		**Measurement criteria**
Reduce the risk of impacts to air quality from petroleum activities	**Reduced sulfur content fuel** Only low-sulfur (0.50 mass % concentration [m/m]) fuel oil will be used to minimise SO_x emissions when available.		Bunker receipts verify the use of low-sulfur fuel oil

	Marine Order 97: Marine Pollution Prevention – Air Pollution Prior to commencement of IMR activities, the following will be verified, as per the MSRE process: • vessels will hold a valid International Air Pollution Prevention (IAPP) certificate and a current international energy efficiency (IEE) certificate • all vessels (as appropriate to vessel class) will have a Ship Energy Efficiency Management Plan (SEEMP) as per MARPOL 73/78 Annex VI • Vessel engine nitrous oxides (NOx) emission levels will comply with Regulation 13 of MARPOL 73/78 Annex VI.	OVIS report / ABU Marine OE Inspection Checklist confirms vessels hold IAPP and IEE certificates, and a SEEMP is in place (as appropriate to class), and NO_x emission levels comply with regulations

6.4.5 Light emissions

Source			
Activities identified as having the potential to result in light emissions are: • navigation and operational lighting from vessels within the OA during IMR activities.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Light emissions may result in: • localised and temporary change in ambient light.	6	A change in ambient light may result in: • attractant for light-sensitive species and in turn affect predator-prey dynamics	6
Consequence evaluation			
Localised and temporary change in ambient light Monitoring undertaken by Woodside (Ref. 84) indicates that light density from navigational lighting on a MODU attenuated to below 1.0 lux and 0.03 lux at distances of ~300 m and ~1.4 km, respectively. Light densities of 1.0 lux and 0.03 lux are comparable to natural light densities experienced during deep twilight and during a quarter moon. Based on Woodside (Ref. 84), CAPL expects that the platform will result in temporary changes to ambient light emissions no larger than a radius of ~1.4 km. Operational and navigational lighting is expected to be similar in comparison to a MODU, therefore referencing this modelling is considered an appropriate approach for this consequence evaluation. Given the limited extent of the change arising from navigational lighting, the impacts associated with a direct change in ambient light levels was determined to be Incidental (6).			
Acting as an attractant to light-sensitive species and in turn affecting predator–prey dynamics There is no evidence to suggest that artificial light sources adversely affect the migratory, feeding, or breeding behaviours of cetaceans. Cetaceans predominantly use acoustic senses rather than visual sources to monitor their environment (Ref. 168), so light is not considered to be a significant factor in cetacean behaviour or survival. Light-sensitive fauna (including reptiles, birds and fish) are the species most at risk from this aspect and thus are the focus of this evaluation. As identified in Section 4.3, several marine species listed as threatened and/or migratory under the EPBC Act have the potential to occur within the OA. Several BIAs also overlap with the OA, including: • Flatback Turtle (interesting buffer, nesting) • Hawksbill Turtle (interesting buffer) • Whale Shark (foraging)			

• Lesser Crested Tern, Wedge-tailed Shearwater (breeding). Studies conducted between 1992 and 2002 in the North Sea confirmed that artificial light was the reason that birds were attracted to and accumulated around illuminated offshore infrastructure (Ref. 169) and that lighting can attract birds from large catchment areas (Ref. 170). These studies indicate that migratory birds are attracted to lights from offshore platforms when travelling within a radius of 5 km from the light source, but their migratory paths are unaffected outside this zone (Ref. 171). The *National Light Pollution Guidelines* (Ref. 10) indicate that a 20 km buffer or exposure area can provide a general precautionary light impact limit based on observed effects of sky glow on marine turtle hatchlings demonstrated to occur at 15–18 km (Ref. 165; Ref. 166) and fledgling seabirds grounded in response to artificial light 15 km away (Ref. 167). Although the OA (associated with the nearshore trunkline) is located adjacent to the coast, vessel activities are expected to be conducted at least 1 km from the coast given the trunkline is installed under the seabed via a microtunnel. Although light emissions have the potential to expose the coast (i.e., within ~1.4 km from the vessel), given the magnitude of the activities covered under this EP, it is not expected that coast would be exposed for a prolonged period of time, or frequently. and thus any impacts would be limited. For the remainder of the OA, lighting emissions associated with vessel operations are not expected to expose turtle hatchlings or seabird fledglings and any emissions that attract a small number of individual seabirds are not expected to result in any impact to the individual or to the greater population. The *Recovery Plan for Marine Turtles in Australia* (Ref. 93) identifies light emissions as a key threat because it can disrupt critical behaviours. However, the Recovery Plan also notes that critical behaviours are focused on nesting (therefore coastal areas), as well as disrupting hatchling orientation and sea-finding behaviours of hatchlings. Given the IMR activities described in this EP, the majority of vessel operations would be located offshore and light emissions would not affect critical behaviours described in the Recovery Plan. Anthropogenic disturbance and artificial lighting is identified as a threat within the *Wildlife Conservation Plan for Migratory Shorebirds* (Ref. 93). However, only a small number of threatened or migratory bird species would be expected to be present in this area. Light emissions that attract a small number of individual seabirds are not expected to result in any impact to the individual or to the greater population. Because light emissions have the potential to cause temporary impacts to a small number of protected species over the course of the activity, CAPL has ranked the consequence associated this impact as Incidental (6).
ALARP decision context justification
Offshore commercial vessel operations and subsequent light emissions arising from these activities are commonplace in offshore environments nationally and internationally. During stakeholder consultation, no objections or claims were raised regarding light emissions arising from the activity. The impacts and risks associated with light emissions are well understood, and considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
None identified	No controls have been applied for these impacts and risks as light management is a lower-order impact and risk; no industry standard controls are required for offshore light emissions where minimal impacts and risks are present.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	Due to the nature and scale of this petroleum activity vessel activities are predominantly occurring within offshore waters away from the coastline. As such the likelihood of exposing sensitive receptors resulting in the identified consequence was considered Remote (5).

Risk level	Very low (10)	
Determination of acceptability		
Principles of ESD	The impact associated with this aspect is disruption to light-sensitive species' behaviour, which given the location, is not considered as having the potential to affect biological diversity and ecological integrity. The impact associated with this aspect is Incidental (6). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered for this aspect include: • *National Light Pollution Guidelines* (Ref. 10) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94) • Wildlife *Conservation Plan for Migratory Shorebirds* (Ref. 93).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	
External context	During stakeholder consultation, no objections or claims were raised regarding light emissions arising from the activity.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
N/A	N/A	N/A

6.4.6 Underwater sound

Source
Activities identified as having the potential to result in underwater sound are: • vessels or helicopter operations within the OA. These activities result in the emission of the following types of sound: **Continuous sound (vessel operations)** Studies of underwater noise generated from propellers of offshore vessels when holding position indicate highest measured sound pressure level (SPL) up to 137 dB re 1 µPa and 120 dB re 1mPa at 405 m and ~3-4 km from the sound source (Ref. 205). **Continuous sound (helicopter operations)** Sound emitted from helicopter operations is typically below 500 Hz (Ref. 224). The peak-received level diminishes with increasing helicopter altitude, but the duration of audibility often increases with increasing altitude. Estimates of SPL for helicopters range 149–162 dB re 1 µPa (Ref. 199 Ref. 225). Richardson et al. (Ref. 199) report that helicopter sound was audible in air for four minutes before it passed over underwater hydrophones, but detectable under water for only 38 seconds at 3 m depth, and 11 seconds at 18 m depth.

Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Underwater sound emissions may result in: localised and temporary change in ambient underwater sound.	5	A change in ambient underwater sound may result in: • behavioural disturbance • auditory impairment, temporary threshold shift (TTS), permanent threshold shift (PTS), recoverable or non-recoverable injury to marine fauna	5

Consequence evaluation

Exposure Criteria

Mid-frequency (dolphins, toothed whales, beaked whales, bottlenose whales [e.g., Indo-Pacific Humpback and Spotted Bottlenose dolphins, Killer Whale, Sperm Whale]) and low-frequency (baleen whales [e.g., Blue, Brydes, Fin, Humpback, Sei, Antarctic Minke whales]) cetaceans have been identified as having the potential to be present within the OA. Exposure criteria for these species is included in Table 6-4.

Exposure criteria for marine turtles is provided in Table 6-5. Behavioural responses have been taken from McCauley et al. (Ref. 190) who reported that exposure to airgun shots caused Green and Loggerhead Turtles to display more erratic behaviours at 175 dB re 1 µPa , with turtles observed to increase their swimming activity at received sound levels of ~166 dB re 1 µPa .

Noise exposure criteria for fish is provided in Table 6-6.

Table 6-7: Noise exposure criteria (continuous sounds) for mid-frequency and low-frequency cetaceans

Cetacean Hearing Group	PTS onset thresholds (received level) (Ref. 188)	TTS onset thresholds (received level) (Ref. 188)	Behavioural Response (Ref. 189)
Low--frequency cetaceans	$L_{E,\,24h}$: 199 dB	$L_{E,\,24h}$: 179 dB	$L_{pk:}$ 120 dB
Mid-frequency cetaceans	$L_{E,\,24h}$: 198 dB	$L_{E,\,24h}$: 178 dB	$L_{pk:}$ 120 dB

Table 6-8: Noise exposure criteria (continuous sounds) for marine turtles

PTS onset thresholds (received level) (Ref. 191)	TTS onset thresholds (received level) (Ref. 191)	Behavioural Response (Ref. 190)
$L_{E,\,24h}$: 220 dB	$L_{E,\,24h}$: 200 dB	—

Table 6-9: Noise exposure criteria (continuous sounds) for fish

Hearing Group	Recoverable Injury (Ref. 192)	TTS onset thresholds (received level) (Ref. 192)
Fish without swim bladders	—	—
Fish with swim bladders	$L_{E,\,48h}$: 170 dB	$L_{E,\,12h}$: 158 dB

Continuous sound (vessel and helicopter operations)

Acoustic modelling undertaken by Woodside for support vessels (Ref. 206) is considered suitable to inform potential sound exposures from this activity as the vessels are expected to be similar in size to those modelled thus source sound levels are expected to be similar, and the physical environment of the operational area is comparable.

The modelling also provides an indication of cumulative sound exposures by considering sound emissions from multiple sources at a single location. In reality, as multiple sound sources will occur at a distance from each other, the model exaggerates near field sound levels and is therefore considered highly conservative.

On the basis that multiple vessels have the potential to be within the OA during IMR activities activity, CAPL acknowledge the potential for cumulative sound emissions. However, modelling of sound exposure levels (SEL) and SEL exposure criteria assumes that transient species would be exposed over a 24 hour period. This is considered highly unlikely as species with the potential to be exposed are mobile and expected to transit through the area, thus cumulative impacts are not expected to arise from this activity.

The outcomes of this modelling are summarised throughout the subsequent risk and impact assessment.

In the absence of modelling, the maximum estimate of SPL from helicopter operations (162 dB re 1 µPa) has been used for the purposes of this consequence evaluation. With the exception of cetaceans, this maximum estimate is below peak SPL noise exposure criteria (and therefore not discussed further in the evaluation for marine reptiles or fish). Similarly, given the nature of helicopter operations (i.e., crew transfers) covered under this EP, exposure to sound from this source for an extended period (e.g., 12 or 24 hours) is not credible, and as such, comparison against the cumulative sound exposure level criterions is not relevant.

Marine Mammals

Behavioural disturbance

Acoustic modelling for support vessels indicate that the maximum radial distance in any direction from the source to 166 dB re 1 µPa was 0.046 km (Ref. 206). Noting that the United States National Marine Fisheries Service (NMFS) recommend applying a noise exposure criteria of 120 dB re 1 µPa for behavioural disturbance (Table 6-7), cetaceans would need to be located close (~0.046 km) to the vessels in order to display some form of avoidance behaviour.

As the OA overlaps a migration BIA for the Pygmy Blue and Humpback whales, there is the potential for a larger number of cetaceans to be present during migration periods. However, given the open-water environment, the close distance to the vessel before a behavioural response is likely to occur, and limited number of vessels in the field, it is not expected that the activity would result in a significant change to migration behaviours or displace species outside of the BIA.

Estimates of SPL for helicopters range 149–162 dB re 1 µPa (Ref. 199; Ref. 225), which is above the NMFS criterion for behavioural disturbance. However, the spatial and temporal extent of the potential exposure to underwater sound from helicopters is limited (e.g., 38 seconds at 3 m depth, and 11 seconds at 18 m depth; Ref. 199). The helicopter operations covered under this EP (i.e., crew transfers for longer IMR campaigns) are also expected to be infrequent. Therefore, given the limited nature of the exposure, potential impacts from helicopters on cetacean behaviour are not evaluated further.

Consequently, only localised short-term behavioural impacts to transient individuals have the potential to arise from these activities and have therefore been evaluated as Minor (5).

TTS and PTS

The NMFS recommend applying a noise exposure criterion of 179 dB re µPa^2.s and 178 dB re µPa^2.s for low and mid frequency cetaceans respectively (Table 6-7).

Acoustic modelling for support vessels indicate that the maximum radial distance in any direction from the source to 170 dB re µPa^2.s was 0.010 km (Ref. 206). On this basis, neither TTS or PTS is likely to occur, as exceedance of the TTS and PTS threshold levels require marine mammals to remain within <10 m of the vessel over a 24-hour period, which is not credible.

Consequently, TTS and PTS from continuous sound sources has not been considered further.

Turtles

Behavioural disturbance

Although pulsed sounds are expected to result in different impacts to that of continuous sounds, in lieu of appropriate continuous noise exposure criteria for turtles, CAPL has applied noise exposure criteria associated with impulsive sound sources. Specifically, 166 dB re 1 µPa (Table 6-5) has been selected as a conservative threshold to inform the evaluation for this potential impact.

Acoustic modelling for support vessels indicates that the maximum radial distance in any direction from the source to 166 dB re 1 µPa was 0.046 km. Therefore, turtles would need to be located close to the vessels in order to display some form of avoidance behaviour.

Although the OA overlaps the Flatback Turtle internesting BIA, Whittock et. al. (Ref. 92) reported that Flatback Turtles preference habitats within proximity of the coast and at relatively shallow depths during the internesting periods. Specifically, during the study, a maximum distance from the nearest coast and maximum water depth of 27.8 km and <44 m respectively was recorded, with the mean maximum distance away from the nearest coast and mean water depth being less than 6.1 km and <10 m respectively (Ref. 92). This suggests that although the OA overlaps the Flatback turtle internesting BIA, due to the distance offshore and increasing water depths it would be very unlikely that turtles would be aggregating within the majority of the OA (noting that higher presence may be expected within the nearshore OA located adjacent to the mainland coast near the shore crossing). Consequently, only a small number of transient marine turtles are expected to be present.

If individual marine turtles do come within close proximity (i.e. < 0.046 km) to a vessel, the behavioural responses are expected to be limited to increased swimming activity / avoidance thus impacts would be temporary in nature. Consequently, only short-term behavioural impacts to individuals have the potential to arise from these activities and have therefore been evaluated as Minor (5).

TTS and PTS

A noise exposure criterion of 200 dB re µPa^2.s and 220 dB re µPa^2.s for TTS and PTS respectively (Table 6-8). Acoustic modelling for support vessels indicate that the maximum radial

distance in any direction from the source to 170 dB re µPa^2.s was less than 0.010 km (Ref. 206). Consequently, TTS and PTS is not expected to occur given that, exceedance of noise exposure criteria requires turtles to remain in vicinity (<10 m) of the vessel over a 24-hour period. Consequently, TTS and PTS from continuous sound sources has not been considered further. **Fish including sharks and rays** *Behavioural disturbance* Due to a lack of data on behavioural impacts to fish from continuous sound sources, CAPL has applied noise exposure criteria associated with TTS. Specifically, a noise exposure criterion of 158 dB 1µPa^2.s (Table 6-9) has been selected as a conservative threshold to inform the evaluation for this potential impact. Acoustic modelling for support vessels indicate that sound levels would exceed the behavioural response noise exposure criteria of 156 dB 1µPa^2.s within 0.097 km of the source. Pelagic fish species are likely to be transient through the OA. If the fish are within the immediate vicinity of the sound source, behavioural responses are expected to be limited to an initial startle reaction before either returning to normal, or resulting in the fish moving away from the area (Ref. 194). Demersal fish species may reside around existing subsea infrastructure (i.e., if it is providing suitable artificial habitat) within the OA. However, given the water depths within most of the OA, the sound levels at the seabed are expected to be below impact thresholds. Consequently, behavioural impacts to pelagic and demersal fish are expected to be limited to the duration of the activity and given the small extent of exposure, only short-term behavioural effects (specifically to pelagic species) are predicted. As such the consequence was evaluated as Minor (5). *TTS and Recoverable injury* Popper *et al.* (Ref. 192) propose noise levels criteria for fish with swim bladders involved in hearing at 170 dB re 1 µPa over 48 hours for a recoverable injury, and 158 dB re 1 µPa over 12 hours for TTS. Acoustic modelling indicates that the maximum radial distance in any direction from the source to 170 re 1µPa^2.s and 158 dB 1µPa^2.s was <0.010 km and 0.097 km respectively (Ref. 206). Pelagic fish species are likely to be transient through the OA. Given their transient nature, these fish are not expected to remain within close proximity (~10–100 m) of a sound source for extended periods (12–48 hours) such that an injury due to continued sound exposure would occur. Demersal fish species may reside around existing subsea infrastructure (i.e., if it is providing a suitable artificial habitat) within the OA. However, given the water depths within most of the OA, the sound levels at the seabed are expected to be below impact thresholds and thus exposure to demersal species is not expected. On this basis, neither TTS nor recoverable injury to fish are considered credible, and have therefore not been considered further.
ALARP decision context justification
Offshore commercial vessel operations are commonplace and well-practised nationally and internationally. The application of control measures to manage impacts and risks arising from this aspect are well defined, understood by the industry, and are considered standard industry practice. During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity. Although some species that are known to be sensitive to underwater sound have the potential to be exposed to underwater noise above exposure criteria during these activities, the impacts and risks arising from underwater sound emissions are considered lower-order impacts and risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans	The requirements to manage interactions between vessels and cetaceans are detailed in the EPBC Regulations 2000 – Part 8 Division 8.1 – Interacting with cetaceans. These regulations describe strategies to ensure whales are not harmed during offshore interactions with people.

	By implementing these control measures and managing interactions with cetaceans near the vessels or any site surveys, the potential impacts from underwater sound are limited.	
Biodiversity Conservation Regulations 2018	The requirements to manage interactions with marine fauna (including cetaceans, Whale Sharks, and Dugongs) and relevant separation distances are detailed in the WA Biodiversity Conservation Regulations 2018. By implementing these control measures and managing interactions with marine fauna near the vessels or any site surveys, the potential impacts from underwater sound are limited.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Baleen whales may exhibit behavioural avoidance when sound levels are at or above 160 dB re 1 µPa (Ref. 189). Baleen whales display a gradation of behavioural responses to pulsed sound, suggesting that acoustic discharges are audible to whales at considerable distances from the source, but that they are not disrupted from normal activities such as vessel operations (Ref. 195), particularly during migration. As described above, other species such as turtles and fish are expected to initially practice avoidance behaviours in response to sound emissions, and thus the likelihood of underwater sound from these activities resulting in longer-term impact is very unlikely (Ref. 194; Ref. 196). Although localised and temporary behaviour disturbance may occur, it is unlikely that this would result in any impact to a sensitive life stage of the fauna identified. Consequently, CAPL consider the likelihood of the consequence occurring as being Rare (6).	
Risk level	Very low (10)	
Acceptability summary		
Principles of ESD	The impacts and risks associated with this aspect are limited to localised, short-term behavioural changes. On the assumption that this potential impact occurs during a sensitive life stage (such as migration), CAPL would not expect these activities to affect migration, internesting, or foraging behaviours, nor impact on individuals or the wider population. As such, this aspect is not considered as having the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no further evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered applicable for this aspect include: • EPBC Regulations 2000 – Part 8 Division 8.1 interacting with cetaceans • Biodiversity Conservation Regulations 2018 • *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • Conservation Advice *Megaptera novaeangliae* Humpback Whale (Ref. 98) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94).	
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.	

External context	During stakeholder consultation, no objections or claims were raised regarding underwater sound emissions arising from the activity.
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that underwater sound is listed as a threat to protected matters under documents made or implemented under the EPBC Act, CAPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) specifies the following relevant action: • anthropogenic noise in BIAs will be managed such that any Blue Whale continues to utilise the area without injury, and is not displaced from a foraging area. No other specific relevant actions were identified within other documents implemented under the EPBC Act. The OA does not intersect with a foraging BIA for the Pygmy Blue Whale (Table 4-2). The nearest foraging BIA occurs ~105 km southwest of the OA, offshore from North West Cape; and as such is not exposed to underwater sound emissions resulting from activities under this EP. Therefore, CAPL has defined an acceptable level of impact as no injury to marine fauna.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
No injury to marine fauna from underwater sound emissions from petroleum activities	**EPBC Regulations 2000 and Biodiversity Conservation Regulations 2018** Vessels will implement caution and no approach zones, where practicable: • caution Zone (300 m either side of whales and 150 m either side of dolphins)– vessels must operate at ≤6 knots within this zone, maximum of three vessels within zone, and vessels should not enter if a calf is present • no approach zone (300 m to the front and rear of whales and 100 m either side; 300 m for whale calves; 150 m to front and rear of dolphins and 50 m either side; 100 m from dugongs; 30 m from whale sharks)–vessels should not enter this zone, and should not wait in front of the direction of travel or an animal or pod, or follow directly behind.	Induction materials include relevant marine fauna caution and no approach zone requirements
		Training records confirm offshore personnel involved in IMR activities have completed the induction

6.4.7 Invasive marine pests

Source			
Activities identified as having the potential to result in the introduction of an invasive marine pest (IMP) are: • planned discharged of ballast water or the presence of biofouling on vessels undertaking IMR activities within the OA.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	An introduction of an IMP may result in: • displacement of, or compete with, native species.	2
Consequence evaluation			
IMPs are likely to have little or no natural competition or predators, thus potentially outcompeting native species for food or space, preying on native species, or changing the nature of the environment. It is estimated that Australia has >250 introduced marine pests, and that approximately one in six introduced marine species becomes a pest (Ref. 208). The particular values and sensitivities within the OA with the potential to be impacted by the introduction of an IMP within the OA include: • continental slope demersal fish communities (KEF) • ancient coastline at 125 m depth contour (KEF) • ridgeline habitat and associated communities. Although two KEFs were identified as having the potential to be exposed, as described in Section 4.5, within the OA, they are known to comprise soft sediment infauna communities. The ridgeline comprises a hard substratum that supports higher amounts of benthic fauna (such as sponges and soft corals), it is located within a relatively undisturbed area within deep-waters. Once established, some pests can be difficult to eradicate (Ref. 209) and therefore there is the potential for a long-term change in habitat structure. Highly disturbed shallow water and coastal marine environments (such as marinas) have been found to be more susceptible to colonisation than open-water environments, where the number of dilutions and the degree of dispersal is high (Ref. 210; Ref. 211; Ref. 212; Ref. 213). Although Invasive Species are identified as being of concern to marine reptile species under the *North-west Marine Bioregional Plan* (Ref. 28), the risk is associated with terrestrial based invasive marine species thus is not relevant to the activities covered under this EP. If an IMP was introduced, and if it did colonise an area, there is the potential for that colony to spread outside the OA resulting in a widespread long-term impact, therefore resulting in a Severe (2) consequence.			
ALARP decision context justification			
Offshore commercial vessel operations, and subsequent planned discharges, are commonplace and well-practised locally, nationally, and internationally. The causes resulting in an introduction of an IMP from a planned release of ballast water or hull biofouling are well understood by the industry and CAPL. The control measures to manage the risk associated with the introduction of an IMP are well defined via legislative requirements that are considered standard industry practice. These control measures are well understood and implemented by the petroleum industry and CAPL. Specifically, CAPL has worked in the region for over 10 years, thus has a demonstrated understanding of industry requirements and their operational implementation in these areas. The risk of introducing an IMP is considered a lower-order risk in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.			

Good practice control measures and source	
Control measure	**Source**
Quarantine procedure	CAPL's *Quarantine Procedure Marine Vessels* (Ref. 60) provides information about quarantine compliance to CAPL, contractors, and others associated

	with marine vessels. The procedure also ensures that the requirements of various legislative or relevant guidelines are met, including: • undertaking biofouling risk assessments in line with the with the *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Ref. 214) and WA Vessel Check system • requirements for biofouling management plans and/or biofouling record books, in accordance with the *Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines)* MPEC.207(62) 2011 (Ref. 9) The quarantine procedure requires that all relevant biofouling information is provided to enable suitable risk assessments to be completed.	
Maritime Arrivals Reporting System (MARS)	Under the Commonwealth *Biosecurity Act 2015*, pre-arrival information must be reported through MARS before a vessel arrives in Australian waters.	
Ballast water management	The *Australian Ballast Water Management Requirements* (Ref. 7) describes the management requirements for ballast water exchange, including: • non-discharge of 'high-risk' ballast water in Australian ports or waters • full ballast exchange outside Australian territorial seas documentation of all ballast exchange activities.	
Anti-fouling certificate	The Commonwealth *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* enacts Marine Order 98 (Marine pollution – anti-fouling systems). This marine order describes the conditions for when an antifouling certificate is required.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	As the scale of vessel activities within shallow waters is limited, and with the well-known and implemented IMP control measures in place, it is considered Rare (6) that an IMP would be introduced resulting in impacts to the ecological functions of the KEFs or ridgeline habitat.	
Risk level	Low (7)	
Acceptability summary		
Principles of ESD	The potential impact associated with this aspect is a widespread long-term impact to benthic communities, which are expected to comprise soft sediment communities. The introduction of an IMP to these communities has the potential to affect biological diversity and ecological integrity. The consequence associated with this aspect is Severe (2). Therefore, further evaluation against the remaining Principles of ESD is required. There is little uncertainty associated with this aspect as the activities and cause pathways are well known and the activities are well regulated and managed. The habitat within the OA is known from baseline studies, thus the understanding of benthic habitat at these locations is well understood (Section 4.3.5). As such, there is limited scientific uncertainty associated with this aspect; consequently the precautionary principle has not been applied.	
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Commonwealth *Biosecurity Act 2015* • Commonwealth *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* (enacted by Marine Order 98 [Marine pollution – anti-fouling systems]) • *Australian Ballast Water Management Requirements* (Ref. 7)	

	• *Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species (Biofouling Guidelines)* MPEC.207(62)) 2011 (Ref. 9) • *National Biofouling Management Guidance for the Petroleum Production and Exploration Industry* (Ref. 214).	
Internal context	This CAPL environmental performance standard / procedure was deemed relevant for this aspect: • *Quarantine Procedure Marine Vessels* (Ref. 60)	
External context	During stakeholder consultation, no objections or claims were raised regarding IMPs arising from the activity.	
Defined acceptable level	These risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the marine environment by preventing introduction of IMPs during petroleum activities	**Quarantine procedure** All marine vessels undertaking activities in the OA must meet the relevant requirements of the *Quarantine Procedure Marine Vessels*, including that where required*:* • biofouling risk assessments are completed biofouling management plans and/or biofouling record books are available.	Records confirm that relevant vessels meet requirements of the *Quarantine Procedure Marine Vessels*
	Maritime arrivals reporting system Vessels entering into the Australian territorial sea from outside Australian territory will complete pre-arrival reporting (unless Excepted under Biosecurity Determination 2016), in accordance with the *Biosecurity Act 2015*	Records confirm that international vessels completed pre-arrival reporting (or can demonstrate meeting conditions for an exception)
	Ballast water management International marine vessels will be required to comply with the key *Australian Ballast Water Management Requirements*, which are: • non-discharge of 'high-risk' ballast water in Australian ports or waters • full ballast exchange outside Australian territorial seas • documentation of all ballast exchange activities.	For international marine vessels, records show compliance with the Australian Ballast Water Management Requirements
	Antifouling certificate Marine vessels greater than 400 GT with an anti-foul coating are to maintain up-to-date international antifouling coating certification in accordance with *Protection of the Sea (Harmful Anti-fouling Systems) Act 2006* and/or the International Convention on the Control of Harmful Anti-fouling Systems on Ships	Records or inspection reports (or equivalent) confirm that international antifouling coating certifications are up-to-date

6.4.8 Planned discharges—Vessel operations

Source			
Activities identified as having the potential to result in planned discharges are: • vessels operations (during IMR activities) within the OA. The types of planned vessel discharges include deck wash-water, fire-fighting foam, sewage, greywater, food wastes, cooling water, and oily bilge water.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
Planned discharges from vessels may result in: • localised and temporary reduction in water quality.	6	A change in ambient water quality may result in: • changes to predator-prey dynamics.	6
Consequence evaluation			
Localised and temporary reduction to water quality Open marine waters are typically influenced by regional wind and large-scale ocean current patterns resulting in the rapid mixing of surface and near-surface waters—where vessel discharges would occur (Ref. 175). Vessel discharges would occur in these surface and near-surface waters. Therefore, nutrients from sewage, or other similar, discharges will not accumulate or lead to eutrophication due to the highly dispersive environment (Ref. 175). This outcome was verified by sewage discharge monitoring for another offshore project (Ref. 207), which determined that a 10 m^3 sewage discharge reduced to ~1% of its original concentration within 50 m of the discharge location. In addition, monitoring at distances 50 m, 100 m, and 200 m downstream, and at five different water depths, confirmed that discharges were rapidly diluted and no elevations in water quality monitoring parameters (e.g., total nitrogen, total phosphorous, and selected metals) were recorded above background levels at any station. This modelling was based on volumes that far exceed volumes expected during support vessel operations. Therefore, the extent of impacts are expected to be localised to the discharge location. Monitoring of desalination brine of continuous wastewater discharges (including cooling water) undertaken by Woodside for its Torosa South-1 drilling program in the Scott Reef complex found that discharge water temperature decreases quickly as it mixes with the receiving waters, with the discharge water temperature being <1 °C above ambient within 100 m (horizontally) of the discharge point, and 10 m vertically (Ref. 207). A vessel's bilge system is designed to safely collect, contain and dispose of oily water so that discharge of hydrocarbons to the marine environment is minimised or avoided. Bilge water is processed via an oil-water separator before being discharged to sea. Discharge is intermittent and occurs at or near surface waters. As such, oily bilge discharges are expected to readily dilute and disperse under the action of waves and currents in surface waters. In addition, once exposed to air, any volatile components of the oil will readily evaporate. Testing of fire-fighting deluge systems onboard vessels often leads to a release of fire-fighting foams offshore. Toxicological effects from these types of foams is typically only associated with prolonged or frequent exposures, such as on land and in watercourses near firefighting training areas (Ref. 226; Ref. 227). These conditions are not consistent with the use under this EP where use of the systems may arise once or twice over the duration of this EP. In their diluted form (as applied in the event of a fire or test), fire-fighting foams are generally considered to have a relatively low toxicity to aquatic species (Ref. 228; Ref. 229) and further dilution of the foam mixtures in dispersive aquatic environments may then occur before there is any substantial demand for dissolved oxygen (Ref. 230). Consequently, CAPL believes that the change in water quality from these standard discharges is limited to a localised area and returns to ambient following completion of the discharge; therefore, any impacts are Incidental (6).			
Changes to predator / prey dynamics The overboard discharge of sewage and macerated food waste creates a localised and temporary food source for scavenging marine fauna or seabirds, whose numbers may temporarily increase as a result, thus increasing the food source for predatory species.			

However, the rapid consumption of this food waste by scavenging fauna, and physical and microbial breakdown, ensures that the impacts of food waste discharges are insignificant and temporary and that all receptors that may potentially be in the water column are not impacted.

The values and sensitivities within the OA with the potential to be affected by changes in predator–prey dynamics include:

- Whale Shark (foraging)
- Fish communities (associated with the various KEFs).

Effects on environmental receptors along the food chain—fish, reptiles, birds, and cetaceans—are not expected beyond the immediate vicinity of the discharge in open waters (Ref. 175).

Studies into the effects of nutrient enrichment from offshore sewage discharges indicate that the influence of nutrients in open marine areas is much less significant than that experienced in enclosed areas (Ref. 176) and suggest that zooplankton composition and distribution in areas associated with sewage dumping grounds are not affected. However, if any changes in phytoplankton or zooplankton abundance and composition occur, they are expected to be localised, typically returning to background conditions within tens to a few hundred metres of the discharge location (Ref. 177; Ref. 178; Ref. 179).

As described above, plankton communities are not affected by sewage discharges, but if they are, such effects would be highly localised (expected to return to background conditions within tens to a few hundred metres of the discharge location). Consequently, subsequent indirect impacts to other marine fauna are not expected, and thus are not considered further.

Although fish are likely to be attracted to these discharges, any attraction and consequent change to predator–prey dynamics is expected to be limited to close to the release and thus is expected to result in localised impacts to species. Any increased predation is not expected to result in more than a limited environmental impact; therefore, the consequence is Incidental (6).

ALARP decision context justification

Offshore commercial vessel operations, and subsequent planned discharges, are commonplace and well-practiced locally, nationally, and internationally. The control measures to manage the risk associated with these planned discharges are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL.

During stakeholder consultation, no objections or claims were raised regarding vessel discharges arising from the activity.

The impacts associated with these discharges are lower-order impacts in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
MARPOL 73/78 sewage discharge	Marine Order 96 (Sewage) gives effect to MARPOL 73/78 Annex IV. MARPOL is the International Convention for the Prevention of Pollution from Ships is aimed at preventing both accidental pollution and pollution from routine operations.
MARPOL 73/78 food waste discharge	Marine Order 95 (Marine pollution prevention – garbage) gives effect to MARPOL 73/78 Annex V, which details the conditions in which macerated and unmacerated food waste can be discharged to the environment.
MARPOL 73/78 oily bilge discharge	Marine Order 91 (Marine pollution prevention – oil) gives effect to MARPOL 73/78 Annex I, which details the conditions by which oily bilge is authorized to be discharged to the environment.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	Given the nature and scale of this activity with standard control measures in place, it is considered Rare (6) that these discharges would result in any impact to the ecological function of the particular values and sensitivities present within the OA.

<table>
<tr><td>Risk Level</td><td colspan="2">Very low (10)</td></tr>
<tr><td colspan="3">Determination of acceptability</td></tr>
<tr><td>Principles of ESD</td><td colspan="2">The potential impact associated with this aspect is limited to a short-term direct reduction in water quality in a localised area, which is not considered as having the potential to affect biological diversity and ecological integrity.
Accordingly, the consequence associated with this aspect is Incidental (6).
Therefore, no further evaluation against the Principles of ESD is required.</td></tr>
<tr><td>Relevant environmental legislation and other requirements</td><td colspan="2">Legislation and other requirements considered relevant to this aspect include:
• Marine Order 91
• Marine Order 95
• Marine Order 96
• MARPOL 73/78 Annex I, IV and V</td></tr>
<tr><td>Internal context</td><td colspan="2">These CAPL environmental performance standard / procedures were deemed relevant for this aspect:
• MSRE process (Ref. 53).</td></tr>
<tr><td>External context</td><td colspan="2">During stakeholder consultation, no objections or claims were raised regarding discharges arising from the activity.</td></tr>
<tr><td>Defined acceptable level</td><td colspan="2">These impacts and risks are inherently acceptable as they are lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.</td></tr>
<tr><td>Environmental performance outcome</td><td>Performance standard / Control measure</td><td>Measurement criteria</td></tr>
<tr><td rowspan="2">Reduce the risk of impacts to marine habitats and fauna from vessel discharges during petroleum activities</td><td>MARPOL 73/78 sewage discharge
Offshore discharge of sewage from vessels will be in accordance with these MARPOL 73/78 Annex IV requirements:
• An IMO approved comminution and disinfection system to discharge (greater than 3 nm from the nearest land); or
• An IMO approved Sewage Treatment Plant at any location; or
• Untreated sewage discharged ≥12 nm from the nearest land while the vessel is proceeding at no less than 4 knots.</td><td>Records show sewage is discharged in accordance with MARPOL 73/78 Annex IV, including current International Sewage Pollution Prevention (ISPP) Certificate (for marine vessels >400 T or certified to carry more than 15 persons)</td></tr>
<tr><td>MARPOL 73/78 food waste discharge
Offshore discharge of food waste from vessels will be in accordance with these MARPOL 73/78 Annex V requirements:
• macerated to no greater than 25 mm and when the marine vessel is at least 3 nm from the nearest land; or
• unmacerated when the marine vessel is at least 12 nm from the nearest land.</td><td>Records show food waste is discharged in accordance with MARPOL 73/78 Annex V</td></tr>
</table>

	MARPOL 73/78 oily bilge water discharge Oily bilge water will be discharged to marine environment only when the concentration is <15 ppm in accordance with MARPOL 73/78, Annex I: • through an IMO approved on board oil-water separator; and • when the marine vessel is en route.	Records show oily bilge water is discharged in accordance with MARPOL 73/78 Annex I, including current International Oil Pollution Prevention (IOPP) Certificate

6.4.9 Unplanned release—Waste

Source			
Activities identified as having the potential to result in the unplanned release of waste are: • vessel operations (during IMR activities) within the OA. Because waste is generated on board vessels, inappropriate management and storage has the potential to result in a release to the environment.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
• N/A	-	Unplanned release of waste to the environment may result in: • marine pollution resulting in entanglement or injury of marine fauna	6
Consequence evaluation			
If hazardous / non-hazardous waste is lost overboard, the extent of exposure to the environment is limited. Marine fauna most at risk from marine pollution include marine reptiles and seabirds, through ingestion or entanglement (Ref. 94; Ref. 96). Ingestion or entanglement has the potential to limit feeding or foraging behaviours and thus can result in marine fauna injury or death. Although marine debris is identified as being of concern to marine reptile species under the *North-west Marine Bioregional Plan* (Ref. 28), the risk is associated with 'land-sourced plastic garbage, fishing gear from recreational and commercial fishing abandoned into the sea, and ship-sourced, solid non-biodegradable floating materials disposed of at sea'. This type of waste is not associated with the activities described under this Plan and given the restricted exposures and the limited quantity of waste with the potential to cause marine pollution that is expected to be generated from this program, it is expected that any impacts from marine pollution would result in limited impacts to individuals. Thus, CAPL ranked this consequence as Incidental (6).			
ALARP decision context justification			
Offshore commercial vessel operations, and the subsequent management of waste, are commonplace and well-practiced activities within the industry. The control measures to manage the risk associated with an unplanned release of waste are well defined via legislative requirements that are considered standard industry practice. There is a good understanding of the release pathways, and the control measures required to manage these events are well understood and implemented by the petroleum industry and CAPL. During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity. An unplanned release of waste is a lower-order risk in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.			

Good practice control measures and source	
Control measure	**Source**
Marine Order 95 (Marine pollution prevention – garbage)	MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships and is aimed at preventing both accidental pollution, and pollution from routine operations. Specifically, MARPOL 73/78 Annex V requires that a garbage management plan and garbage

	record book is in place and implemented and describes various requirements that are to be applied when managing waste offshore. Marine Order 95 (Marine pollution prevention – garbage) gives effect to MARPOL 73/78 Annex V.		
Additional control measures and cost benefit analysis			
Control measure	**Benefit**		**Cost**
N/A	N/A		N/A
Likelihood and risk level summary			
Likelihood	Marine pollution arising from mismanaged waste offshore has occurred previously in the industry but is not expected to occur during these activities, given the control measures in place. As such, the likelihood of incidental consequences to values and sensitivities from an unplanned release of waste is considered Remote (5).		
Risk level	Very low (10)		
Determination of acceptability			
Principles of ESD	The potential impact associated with this aspect is limited to individuals and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Incidental (6). Therefore, no additional evaluation against the Principles of ESD is required.		
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Marine Order 95 • MARPOL 73/78 • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94) • *National Recovery Plan for Threatened Albatrosses and Giant Petrels 2011–2016* (Ref. 182)		
Internal context	No CAPL environmental performance standards / procedures were deemed relevant for this aspect.		
External context	During stakeholder consultation, no objections or claims were raised regarding waste management arising from the activity.		
Defined acceptable level	These impacts are inherently acceptable as they are lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.		
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**	
No uncontrolled release of waste to the environment during petroleum activities	**Marine Order 95 (Marine pollution prevention – garbage)** Marine vessels >100 T (or certified to carry >15 persons) will have a Garbage Management Plan on board, in accordance with MARPOL 73/78 Annex V	OVIS report / ABU Marine OE Inspection Checklist verifies that a Garbage Management Plan is on board marine vessels >100 T or certified to carry >15 persons	
	Marine Order 95 (Marine pollution prevention – garbage) Marine vessels >400 T (or certified to carry >15 persons) will have a	Current and completed Garbage Record Book (for marine vessels >400 T or certified to carry >15 persons)	

	Garbage Record Book on board, in accordance with MARPOL 73/78 Annex V	
	Marine Order 95 (Marine pollution prevention – garbage) For waste that is incinerated on board a marine vessel, the incinerator is to be IMO-approved and the waste incinerated is to be recorded in accordance with MARPOL 73/78 Annex V	Current International Air Pollution Prevention (IAPP) Certificate (for marine vessels >400 T or certified to carry >15 persons) Current and completed Garbage Record Book (for marine vessels >400 T or certified to carry >15 persons).

6.4.10 Unplanned release—Loss of containment

Source

Activities identified as having the potential to result in a minor loss of containment (LOC) event:

- vessel operations within the OA.

Based on the activities described in this EP, the following potential minor LOC scenarios were identified:

- mechanical failure/damage or human error of hazardous materials storage resulting in a loss of diesel or other fluid[1]
- mechanical failure/damage or human error during bunkering resulting in a loss of marine fuel[2].

[1] A range of hydrocarbons and other hazardous chemicals / materials are likely to be present during start-up and operation activities; however, the maximum credible volume associated with a single-point failure was estimated to be ~1 m^3 based on the loss of an entire intermediate bulk container due to rupture while handling.

[2] AMSA (Ref. 149) suggests the maximum credible spill volume from a refuelling incident with continuous supervision is approximately the transfer rate × 15 minutes. Assuming failure of dry-break couplings and an assumed 200 m^3/h transfer rate (based on previous operations), this equates to an instantaneous spill volume of ~50 m^3.

Potential impacts and risks

Impacts	C	Risks	C
N/A	-	Unplanned release of hazardous material to the environment may result in: • indirect impacts to fauna arising from chemical toxicity	5

Consequence evaluation

Upon release, a loss of 50 m^3 of a hazardous product (such as light hydrocarbons [diesel] or chemicals) would be expected to change the water quality of both surface and pelagic waters.

The environmental impacts associated with a surface release of 50 m^3 of marine diesel oil (MDO) or other hazardous materials are expected to be much less than those associated with a loss of hydrocarbons from a vessel collision (Section 7.2), and thus are not evaluated in detail here.

The values and sensitivities within the OA with the potential to be exposed to decreased water quality from a minor LOC surface release include:

- Humpback Whale (migration)
- Pygmy Blue Whale (migration and distribution)
- Flatback Turtle (interesting buffer, nesting)
- Hawksbill Turtle (interesting buffer)
- Whale Shark (foraging).

Based on the nature of these unplanned releases, which are non-continuous and expected to occur in a location where no specific sedentary behaviours for values and sensitivities have been identified, the extent and severity of any potential impact is expected to be limited.

Given the nature of unplanned releases covered under this EP and the transient nature of identified values and sensitivities, fauna would need to pass directly through the plume almost immediately upon release to be impacted.

Any potential impact from such an event is expected to be short term and limited to a small number of individuals, thus the consequence level was determined as Minor (5).

ALARP decision context justification

Offshore vessel operations are commonplace and well-practised offshore activities. The control measures to manage the risk associated with minor LOC scenarios from these activities are well defined via legislative requirements that are considered standard industry practice. There is a good understanding of potential spill sources, and the control measures required to managed these are well understood and implemented by the petroleum industry and CAPL.

During stakeholder consultation, no objections or claims were raised regarding minor LOC management arising from the activity.

These risks are lower-order risks in accordance with Table 5-3. As such, CAPL applied ALARP Decision Context A for this aspect.

Good practice control measures and source

Control measure	Source
MSRE process	The MSRE process (Ref. 53) ensures that various legislative requirements and CAPL standards are met. Specifically, pre-mobilisation inspections may include: • visual checks of accessible equipment and hydraulic hoses for defects • confirmation that dry-break couplings or similar automated stop devices are available for use on marine vessels that are refuelled at sea • secondary containment is available for hydrocarbons and chemicals stored on the deck of marine vessels • bunkering procedures are available.
Ship Oil Pollution Emergency Plan (SOPEP)/ Shipboard Marine Pollution Emergency Plan	MARPOL 73/78 Annex I and Marine Order 91 (Marine pollution prevention – oil) requires that each vessel has an approved SOPEP in place. To prepare for a spill event, the SOPEP details: • response equipment available to control a spill event • review cycle to ensure that the SOPEP is kept up to date • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SOPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the discharge of oil • procedures for coordinating with local officials.

Additional control measures and cost benefit analysis

Control measure	Benefit	Cost
N/A	N/A	N/A

Likelihood and risk level summary

Likelihood	The likelihood that a minor LOC event results in a Minor (5) consequence was determined to be Remote (5). With the control measures in place, it was considered very unlikely that a minor LOC event associated with this activity would occur, and even more unlikely that such an event would impact any of the identified values and sensitivities, which are known to be transient and unlikely to be present at the exact location of the minor LOC.
Risk level	Very low (9)

Determination of acceptability	
Principles of ESD	The potential impact associated with this aspect would be short term, apply to some individuals, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements considered relevant for this aspect include: • Marine Order 91, Marine pollution prevention – oil • MARPOL 73/78
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: MSRE process (Ref. 53).
External context	During stakeholder consultation, no objections or claims were raised regarding minor LOC management arising from the activity.
Defined acceptable level	These impacts are inherently acceptable as they are lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**MSRE process** Prior to commencement of IMR activities, the following will be undertaken during a pre-mobilisation vessel inspection, as per the MSRE process: • visual checks of accessible equipment and hydraulic hoses for defects • confirmation that dry-break couplings or similar automated stop devices are available for use on marine vessels that are refuelled at sea • confirmation that secondary containment is available for hydrocarbons and chemicals stored on the deck of marine vessels.	OVIS report / ABU Marine OE Inspection Checklist confirms that equipment and hydraulic hoses are visually free of defects, dry-break couplings or similar are available for use, and, and secondary containment is available on the deck of the marine vessel
	MSRE process Refuelling is undertaken in accordance with CAPL-approved refuelling / bunkering procedures, which include the appropriate weather / sea / visibility conditions, as determined by the Vessel Master.	Records confirm that refuelling is undertaken in accordance with CAPL-approved refuelling / bunkering procedure
	SOPEP Marine vessels >400 T will carry on board a Shipboard Oil Pollution Emergency Plan (SOPEP) in	OVIS report / ABU Marine OE Inspection Checklist confirms an approved SOPEP is on board marine vessels >400 T

	accordance with MARPOL 73/78 Annex I – Prevention of Oil Pollution	Inspection records (or similar) show drills conducted in accordance with SOPEP
		Inspection records (or similar) show spill kits available in accordance with SOPEP
	SOPEP In the event of a vessel-based spill event, emergency response activities will be implemented in accordance with the vessel SOPEP (or equivalent)	Records confirm that emergency response activities were implemented in accordance with the vessel SOPEP in the event of a vessel-based spill.

7 environmental impact and risk assessment and management—emergency events and response

This section provides an evaluation of the impacts and risks associated with emergency events/response appropriate to the nature and scale of each impact and risk, details the control measures that are used to reduce the risks to ALARP and to an acceptable level, and identifies the associated environmental performance outcomes, performance standards, and measurement criteria.

Table 7-1 summarises the impacts and risks that were identified and evaluated for this activity.

Table 7-1: Summary of impact and risk evaluation—emergency events and response

Section	Aspect	Impact	Risk			Decision context	ALARP	Acceptable
		C^	C^	L	R			
7.1	Unplanned release—major defect event	–	5	5	9	A	Yes	Yes
7.2	Unplanned release—vessel collision event	–	5	5	9	A	Yes	Yes
7.3.4.1	Ground disturbance—shoreline spill response	–	5	5	9	A	Yes	Yes
7.3.4.2	Physical presence—oiled wildlife response	–	5	5	9	A	Yes	Yes

C = consequence, L = likelihood, R = risk

^ Where an aspect is identified as having both potential impacts and risks, the highest-level consequence was evaluated in detail to ensure that justification is provided to support the highest consequence level for that aspect.

7.1 Unplanned release—major defect event

7.1.1 Credible scenario

The *Wheatstone Project: Producing Phase Well Operations Management Plan* (Ref. 8) identifies the following key risks to well integrity during start-up and operations:

- mechanical failure (leaks in annulus or production casing)
- overpressure (overpressure of annulus leading to burst casing or collapsed tubing)
- corrosion (corrosions leading to loss of tubing or casing integrity)
- erosion of barriers through excessive solids production
- operating error (incorrect operation of valves or controls, or SIMOPS clashes)
- dropped objects onto the well envelope (potential damage to subsea tree).

The WOMP only identified a full loss of well control event as a risk during well interventions (Ref. 8). This type of activity is not within this scope of this EP (Section 2.3.2).

Therefore, upon evaluating the risks associated with activities covered under this EP, CAPL considers that a major defect in a flowline or trunkline is the most credible (but unlikely) unplanned event. Specifically, a full-bore rupture (FBR) was selected as the worst-case major defect event.

For the purpose of this risk assessment, modelling to determine the credible spill volumes from a FBR event was completed for three locations along the trunkline: inner (nearshore), middle, and outer (platform) (Ref. 79).

Results indicated it would conservatively take ~2 hours to detect and isolate the trunkline following a FBR, based on the time it takes for the arrival pressure at the LNG Plant to drop from maximum operating pressure to below the minimum arrival pressure, assuming no isolation of flow into the trunkline. Such a drop in delivery pressure at the downstream plant will trigger alarm/detection and production would cease.

Consequently, a FBR at the middle location would result in ~3,710 m^3 of condensate fluids being released within ~7.2 hours, which includes the 2 hours required for detection and isolation (Ref. 79). This is the largest volume released of the three scenarios, as the middle location FBR would be fed by product from both upstream and downstream of the rupture location. The inner nearshore location and the outer platform location would result in smaller spill volumes due to reasons associated with the depth and pressure at those sites (Ref. 79).

Discussions with RPS suggested that using a constant release rate based on the volume and duration of release would be representative given the conservatism built into the initial spill release volume calculations. In reality, the release rate is likely to decrease over time as the trunkline depressurises and as surrounding hydrostatic pressure from the water reduces the flow and volume.

7.1.2 Spill modelling

CAPL commissioned RPS to conduct spill modelling to inform the risk assessment associated with a major defect event.

Two models were used as part of the spill modelling: OILMAP-DEEP was used to simulate the nearfield multiphase plume rise dynamics from the subsea release, and a three-dimensional oil spill model (SIMAP) was used to simulate the drift, spread, weathering and fate of the spilled oil (Ref. 109). Modelling was conducted using a stochastic approach, where multiple simulations (using the same spill parameters) were conducted, but under varying meteorological and oceanographic conditions.

Table 7-2 summarises the model settings; Table 7-3 summarises the hydrocarbon properties for the trunkline condensate; and Table 7-4 and Table 7-5 describe the modelled environmental exposure and impact thresholds respectively.

Table 7-2: Major defect spill scenario model settings

Parameter	Details	
Release Location	Nearshore trunkline	Middle trunkline
Latitude	21°35’33.44” S	20°44’51.66” S
Longitude	114°57’37.30” E	114°51’52.14” E
Water Depth	10 m	115 m
Oil type	Trunkline condensate	Jansz condensate
Simulation spill type	Subsea	
Simulation spill volume	3,000 m^3	4,000 m^3

Parameter	Details	
Simulation spill duration	25 hours	7 hours
Total simulation duration	30 days	
Number of randomly selected spill simulation start times	100 per season (300 total)	
Seasons modelled	Summer (October to March) Transitional (April and September) Winter (May to August)	

Table 7-3: Physical properties and boiling point ranges for Trunkline condensate

Characteristic	Value			
Density	770.0 kg/m^3 (at 15 °C)			
Dynamic viscosity	1.248 cP (at 20 °C)			
Pour point	-24 °C			
API gravity	52.3 API			
Classification	Group I, non persistent oil			
Boiling point	Volatile <180 °C	Semi-volatile 180–265 °C	Low volatility 265–380 °C	Residual >380 °C
	62.1%	22.4%	12.8%	2.7%

Table 7-4: Hydrocarbon environmental exposure thresholds

Environmental exposure threshold^	Justification
Surface ≥1 g/m^2 (low)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the surface exposure threshold at ≥1 g/m^2. This threshold is used to establish a planning area for scientific monitoring (Ref. 110).
In-water (dissolved) ≥10 ppb (low)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the in-water (dissolved) exposure threshold at ≥10 ppb. This threshold is used to establish a planning area for scientific monitoring (specifically, for water quality) (Ref. 110).
In-water (entrained) ≥10 ppb (low)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the in-water (entrained) exposure threshold at ≥10 ppb. This threshold is used to establish a planning area for scientific monitoring (specifically, for water quality) (Ref. 110).
Shoreline ≥10 g/m^2 (low)	CAPL has set the shoreline exposure threshold at ≥10 g/m^2. This threshold is consistent with the low exposure value for shoreline oil within NOPSEMA's oil spill modelling bulletin (Ref. 110).

^ Environmental exposure thresholds have been used to define the EEA, and the presence of environmental values and sensitivities within this area have been identified in Section 4. These exposure thresholds and the spatial extent of the EEA is not used as part of the environmental impact and risk assessment presented below.

Table 7-5 Hydrocarbon environmental impact thresholds

Environmental impact threshold	Justification
Surface ≥1 g/m^2 (low)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the surface impact threshold for socio-economic effects at ≥1 g/m^2. This threshold is equivalent to ~1,000 L/km^2 or a layer thickness of ~1 µm.

Environmental impact threshold	Justification
	At this concentration, oil on the water surface is expected to be visible. The Bonn Agreement Oil Appearance Code (Ref. 111) describes a 0.3–5.0 µm thick oil layer as having a rainbow-coloured appearance. Due to this visibility, there is the potential to impact nature-based activities (such as tourism) via a reduction in aesthetics.
Surface ≥10 g/m^2 (moderate)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the surface impact threshold for ecological effects at ≥10 g/m^2. This threshold is equivalent to ~10,000 L/km^2 or a layer thickness of ~10 µm. The Bonn Agreement Oil Appearance Code (Ref. 111) describes a 5–50 µm thick oil layer as having a metallic appearance. This threshold is considered by NOPSEMA to approximate the lower limit of harmful effects to birds and marine mammals (Ref. 110). This threshold is consistent with observations ranging from physical oiling to toxicity effects for marine fauna within literature, including French et al. (Ref. 112), French-McCay (Ref. 113), Engelhardt (Ref. 114), Clark (Ref. 115), Geraci and St. Aubin (Ref. 116) and Jenssen (Ref. 117).
In-water (dissolved) ≥50 ppb (moderate)	Laboratory studies have shown that dissolved oil exert most of the toxic effects of oil on aquatic biota (e.g., Carls et al. [Ref. 118], Nordtug et al. [Ref. 119], Redman [Ref. 120]). Being soluble, the dissolved oil can be taken up by organisms directly from the water column by absorption through external surfaces and gills, as well as through the digestive tract. In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the in-water (dissolved) impact threshold for sublethal ecological effects at ≥50 ppb. This threshold is considered by NOPSEMA to approximate potential toxic effects, particularly sublethal effects to sensitive species (Ref. 110). This threshold is based on an instantaneous concentration, and therefore only requires the dissolved oil to be at this concentration for one-hour (based on minimum model time-step) to trigger this threshold.
In-water (dissolved) ≥4,800 ppb.hrs (moderate)	Toxicity is the relative ability of a substance to cause adverse effects; and this relative ability is dependent on factors including both dose and duration. As such, CAPL has set the in-water (dissolved) impact threshold for lethal ecological effects at ≥4,800 ppb.hrs. This threshold is based on the instantaneous concentration (50 ppb) recommended by NOPSEMA but also applies a duration component of 96 hours. Therefore, dissolved oil needs to be at this concentration consistently for 96 hours to trigger this threshold. French-McCay (Ref. 121) reviewed toxicity data for marine biota exposed to dissolved oil and found that 95% of species and life stages exhibited 50% population mortality (LC50) for total PAH concentrations between 6–400 ppb (with an average of 50 ppb) after 96 hours exposure.
In-water (entrained) ≥100 ppb (high)	Entrained oil are insoluble droplets suspended in the water column, and as such exposure pathways are direct contact with external tissue or direct oil consumption. In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the in-water (entrained) impact threshold for sublethal ecological effects at ≥100 ppb. This threshold is considered by NOPSEMA as appropriate for informing risk evaluation (Ref. 110). This threshold is based on an instantaneous concentration, and therefore only requires the entrained oil to be at this concentration for one-hour (based on minimum model time-step) to trigger this threshold. French-McCay (Ref. 122) identified that if total hydrocarbons in entrained oil droplets was to be evaluated as a risk, 100 ppb would be an extremely conservative sublethal threshold.

Environmental impact threshold	Justification
In-water (entrained) ≥9,600 ppb.hrs (high)	CAPL has set the in-water (entrained) impact threshold for lethal ecological effects at ≥9,600 ppb.hrs. This threshold is based on the instantaneous concentration (100 ppb) recommended by NOPSEMA but also applies a duration component of 96 hours. Therefore, entrained oil needs to be at this concentration consistently for 96 hours to trigger this threshold. It is however noted that entrained oil, especially when in weathered state, is typically not considered toxic.
Shoreline ≥10 g/m^2 (low)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the shoreline impact threshold for socio-economic effects at ≥10 g/m^2. This threshold is equivalent to ~10 mL/m^2 or ~2 teaspoons/m^2. At this concentration, oil on the shoreline is expected to be visible. Due to this visibility, there is the potential to impact nature-based activities (such as tourism or recreational use) via a reduction in aesthetics.
Shoreline ≥100 g/m^2 (moderate)	In accordance with NOPSEMA's oil spill modelling bulletin (Ref. 110), CAPL has set the shoreline impact threshold for ecological effects at ≥100 g/m^2. This threshold is equivalent to ~100 mL/m^2 or 20 teaspoons/m^2. French et al. (Ref. 112) and French-McCay (Ref. 113) define shoreline oil accumulation at ≥100 g/m^2 as potentially harmful to wildlife (including invertebrates, birds, furbearing aquatic mammals and marine reptiles), based on studies for sub-lethal and lethal impacts. Impacts on vegetated habitats (such as saltmarsh and mangroves) have been observed at higher concentrations of shoreline oil. Observations by Lin and Mendelssohn (Ref. 123) demonstrated that loadings of >1,000 g/m^2 of oil during the growing season would be required to impact marsh plants significantly. Similar thresholds have been found in studies assessing oil impacts on mangroves (e.g., Grant et al. [Ref. 124], Suprayogi and Murray [Ref. 125]).

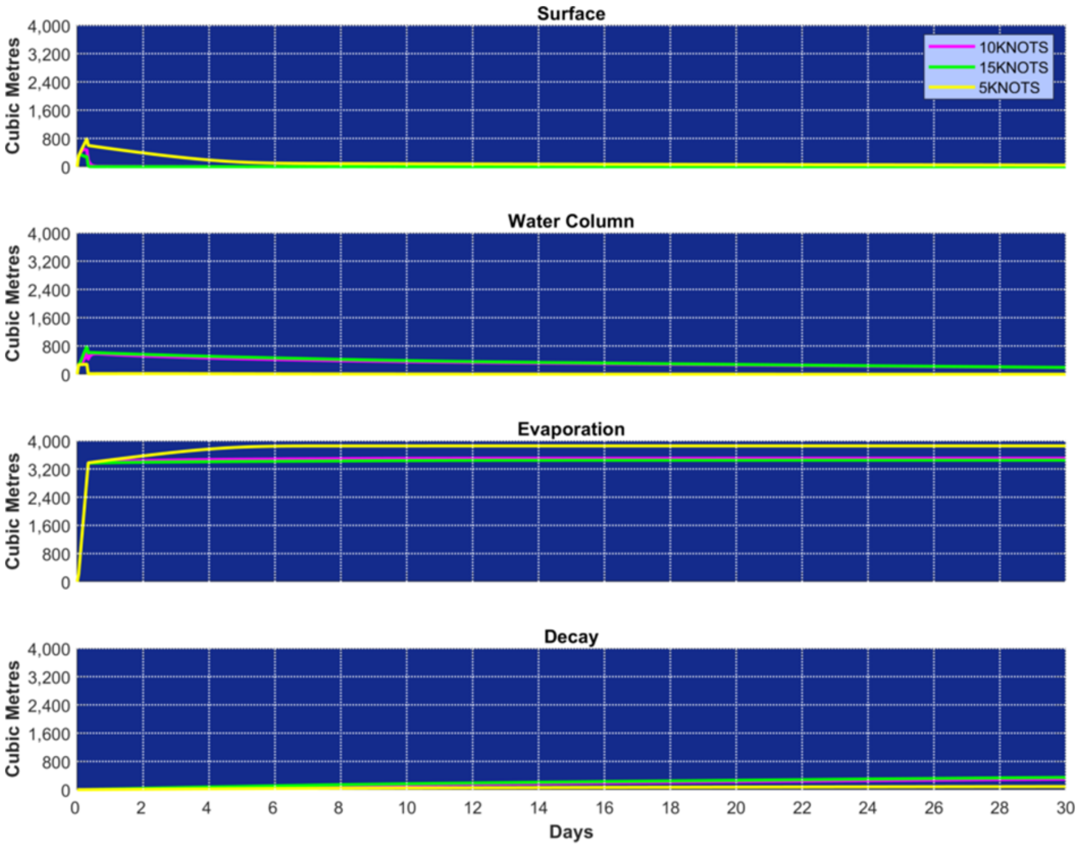
^ Environmental impact thresholds have been used to define the EMBA, and the presence of environmental values and sensitivities within this area have been identified in Section 4. These impact thresholds and the spatial extent of the EMBA is used as part of the environmental impact and risk assessment presented below.

7.1.2.1 Weathering and fate

The trunkline condensate is a mixture of several oil types (i.e., a mixture of oils originating from Wheatstone, Iago, and JDP). The trunkline condensate is non-persistent oil, with a density of 770.0 kg/m^3, an API of 52.3, and a low pour point (−24 °C) (Table 7-3). The low viscosity (1.248 cP) indicates that this oil will spread quickly when released and will form a thin film on the sea surface, increasing the evaporation rate.

Generally, 62.1% of the trunkline condensate mass should evaporate within the first 12 hours (boiling point <180 °C); a further 22.4% should evaporate within the first 24 hours (boiling point 180°C–265 °C); and an additional 12.8% should evaporate over several days (boiling point 265°C–380 °C). Approximately 2.7% (by mass) of the trunkline condensate will not evaporate at atmospheric temperatures. These compounds will persist in the environment.

Figure 7-1 shows predicted weathering for a subsea release of 4,000 m^3 over 7 hours of the trunkline condensate (tracked for 30 days) under three static wind conditions. Predictions show that under all wind conditions, >80% of the slick volume evaporated within the initial 24 hours, demonstrating the highly evaporative nature of this condensate once on the sea surface.



(Source: Ref. 109)

Figure 7-1: Predicted weather of a subsea release of 4,000 m^3 over 7 hours under three static wind conditions

7.1.2.2 Modelling outputs

Stochastic modelling outputs from RPS (Ref. 109) are summarised in Table 7-6 having regard to the particular values and sensitivities within the EMBA as identified in Section 4.

For the 3,000 m^3 nearshore trunkline FBR:

- The maximum distance from the release location to the ≥1 g/m^2 visible impact threshold was ~47 km west-southwest (winter), and ~14 km west-southwest (winter) for the ≥10 g/m^2 impact threshold.
- The probability of contact to any shoreline at ≥10 g/m^2 was 46%, 59% and 88% in summer, transitional and winter months, respectively. The minimum time before shoreline contact was ~1 hour and the maximum volume of oil ashore was ~225.7 m^3. The maximum length of shoreline exposed at ≥10 g/m^2 was ~6 km, and at ≥100 g/m^2 was ~5 km.
- Dissolved oil at ≥50 ppb impact threshold was predicted to occur; however, remained in the surface layers (<20 m water depth) only. Dissolved oil at ≥4,800 ppb.hrs impact threshold was predicted to occur; however, remained in the surface layer (<10 m water depth) only.
- Entrained oil at ≥100 ppb impact threshold was predicted to occur; however, remained in the surface layers (<20 m water depth during summer; <10 water depth during winter and transitional) only. Entrained oil at ≥9,600 ppb.hrs

impact threshold was predicted to occur; however, remained in the surface layer (<10 m water depth) only.

For the 4,000 m^3 middle trunkline FBR:

- The maximum distance from the release location to the ≥1 g/m^2 visible impact threshold was ~61 km south (summer), and ~55 km west-southwest (transitional) for the ≥10 g/m^2 impact threshold.
- No shoreline accumulation above impact thresholds was predicted to occur during any season.
- Dissolved oil at ≥50 ppb impact threshold was predicted to occur; however, remained in the surface layers (<20 m water depth) only. Dissolved oil at ≥4,800 ppb.hrs impact threshold was predicted to occur; however, remained in the surface layer (<10 m water depth) only.
- Entrained oil at ≥100 ppb impact threshold was predicted to occur; however, remained in the surface layers (<20 m water depth) only. Entrained oil at ≥9,600 ppb.hrs impact threshold was predicted to occur; however, remained in the surface layer (<10 m water depth) only.

Table 7-6: Major defect spill modelling EMBA receptor exposure summary

Sensitivity	Name	Surface^ (probability of exposure, minimum time to exposure)		In-water (dissolved)^ (probability of exposure)		In-water (entrained)^ (probability of exposure)		Shoreline^ (probability of exposure, minimum time to exposure, mean length of shoreline)	
		≥1 g/m²	≥10 g/m²	≥50 ppb	≥4,800 ppb.hrs	≥100 ppb	≥9,600 ppb.hrs	≥10 g/m²	≥100 g/m²
AMP	Gascoyne	—	—	0–1%	—	0–7%	0–1%	—	—
	Montebello	—	—	—	—	0–2%	0–1%	—	—
	Ningaloo	—	—	—	—	0–10%	0–1%	—	—
KEF	Ancient coastline at 125 m depth contour	0–100%, ~1 hour	0–100%, ~1 hour	0–82%	0–74%	0–73%	0–75%	—	—
	Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	0–21%, ~1 hour	0–4%, ~0.75 days	0–1%	—	0–17%	0–1%	—	—
	Commonwealth waters adjacent to Ningaloo Reef	—	—	—	—	0–10%	0–1%	—	—
	Continental slope demersal fish communities	—	—	0–8%	—	0–35%	0–15%	—	—
	Exmouth Plateau	—	—	—	—	0–3%	—	—	—
	Glomar Shoals	—	—	—	—	—	—	—	—
World Heritage Properties / National Heritage Places	The Ningaloo Coast *(inferred from Cape Range IBRA)*	0–100%, ~1 hour	0–82%, ~1 hour	0–100%	0–92%	0–100%	0–2%	—	—
Commonwealth Heritage Properties	Ningaloo Marine Area – Commonwealth Waters *(inferred from Ningaloo IMCRA)*	—	—	0–6%	—	0–12%	0–1%	—	—

^ Values shown represent the variation in probability, shortest minimum time to exposure, and longest mean length of shoreline from both scenarios modelled. Actual probabilities of exposure for listed sensitivities vary greatly between each individual scenario and season.

7.1.3 Risk assessment

Source			
Activities identified as having the potential to result in a major defect event are: • dropped objects from vessels during IMR activities within the OA • pipeline degradation (e.g., corrosion) or functional errors (e.g., overpressure) • operating error.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	—	The potential environmental impacts associated with hydrocarbon exposures from a vessel collision event are:	
		• marine pollution resulting in acute and chronic impacts to marine fauna	5
		• smothering of subtidal and intertidal habitats	5
		• indirect impacts to commercial fisheries	5
		• reduction in amenity resulting in impacts to tourism and recreation.	5

Consequence evaluation

Marine pollution resulting in acute and chronic impacts to marine fauna

Marine mammals

Marine mammals may be exposed to hydrocarbons from an oil spill at the water surface or within the water column. Marine mammals can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (Ref. 126; Ref. 127).

Direct contact with hydrocarbons may result in skin and eye irritation, burns to mucous membranes of eyes and mouth, and increased susceptibility to infection (Ref. 128). However, direct contact with surface oil is considered to have little deleterious effect on whales, possibly due to the skin's effectiveness as a barrier. Furthermore, effect of oil on cetacean skin is probably minor and temporary (Ref. 128). French-McCay (Ref. 129) identifies that a ≥10 g/m^2 oil thickness threshold has the potential to impart a lethal dose to the species; however, also estimates a probability of 0.1% mortality to cetaceans if they encounter these thresholds based on the proportion of the time spent at surface.

The physical impacts from ingested hydrocarbons with subsequent lethal or sublethal impacts are applicable; however, the susceptibility of cetaceans varies with feeding habits. Baleen whales are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface (i.e., they are more susceptible to surface slicks). Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >48–96 hours) that would lead to chronic effects.

Studies have shown little impact on Bottlenose Dolphins after hydraulic and mineral oil immersion and ingestion, although there was evidence of temporary skin damage in dolphins and a Sperm Whale from contact with various oil products including crude oil (Ref. 128; Ref. 130).

Marine mammals are vulnerable if they inhale volatiles when they surface within a hydrocarbon slick. For the short period that they persist, vapours from the spill are a significant risk to mammal health, with the potential to damage mucous membranes of the airways and the eyes, which will reduce the health and potential survivability of an animal. Inhaled volatile hydrocarbons are transferred rapidly to the bloodstream and may also accumulate in tissues (Ref. 128).

Stochastic modelling was used to identify BIAs for marine mammals that may be exposed to hydrocarbon concentrations greater than impact thresholds within the EMBA. These were:

- Humpback Whale (migration, resting)

- Pygmy Blue Whale (distribution, migration, foraging)
- Dugongs (breeding, calving, foraging, nursing).

As these species are considered most sensitive to surface exposures, deterministic analysis for the largest sea surface swept area was utilised to understand the potential extent and duration of exposure. Of the scenarios modelled, (deterministic analysis from the middle trunkline 4,000 m^3 subsea condensate release was selected for use given it presents the most conservative surface hydrocarbon exposure extent. The maximum area for visible floating oil was predicted to occur ~1.75 days after the spill started and covered ~37 km^2. Using the Pygmy Blue Whale migration BIA as an example, modelling indicates that the extent of surface exposures was predicted to be limited to <1% of the entire BIA.

Based on an assessment of the predicted magnitude and duration of surface oil, and both instantaneous and time-integrated entrained oil, it is expected that only a small proportion of any marine mammal population would be exposed above the defined impact exposure thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Reptiles

Marine reptiles may be exposed to hydrocarbons from an oil spill at the water surface or on the shoreline. Marine reptiles can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (Ref. 131).

Marine turtles are vulnerable to the effects of oil at all life stages: eggs, hatchlings, juveniles, and adults. Several aspects of turtle biology and behaviour place them at risk, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Ref. 132). Oil effects on turtles can include impacts to the skin, blood, digestive, and immune systems, and increased mortality due to oiling.

Shoreline hydrocarbons can impact turtles coming ashore at nesting beaches. Eggs may also be exposed during incubation, potentially resulting in increased egg mortality and detrimental effects on hatchlings. Hatchlings may be particularly vulnerable to toxicity and smothering as they emerge from the nests and make their way over the intertidal area to the water (Ref. 131).

BIAs for the Flatback Turtle, Loggerhead Turtle, Green Turtle, and Hawksbill Turtle may be exposed to hydrocarbon concentrations greater than the impact thresholds. The behaviours associated with these BIAs include aggregation, basking, foraging, internesting, mating, and nesting.

The deterministic analysis for the largest volume of oil ashore (from the nearshore trunkline 3,000 m^3 condensate release) indicates that shoreline hydrocarbons concentrations ≥100 g/m^2 are present within ~2 days following the spill event, with a maximum volume ashore of ~225 m^3. Stochastic modelling also showed that the longest length of shoreline with exposure of ≥100 g/m^2 is ~5 km. Therefore, as the extent and duration of exposure to shorelines and associated nesting areas is expected to be limited, the potential for environmental impacts would also be limited.

Deterministic analysis for largest sea surface swept area indicates the maximum area for visible floating oil was predicted to occur ~1.75 days after the spill started and covered approximately 37 km^2 (from the 4,000 m3 middle trunkline scenario) Using the Hawksbill Turtle internesting BIA around Thevenard Island as an example, modelling indicates that the extent of surface exposures was predicted to be limited to <2% of the entire BIA. This information indicates that if a spill event occurred during the nesting season, it is unlikely to impact entire local nesting populations.

Based on an assessment of the predicted magnitude and duration of surface and shoreline oil, it is expected that only a small proportion of any marine reptile population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Fishes, including sharks and rays

Fish, including sharks and rays, may be exposed to hydrocarbons from an oil spill within the water column. Most fish do not break the sea surface, and therefore the risk from surface oil is not relevant; however, some shark species (including Whale Sharks) feed in surface waters, so there is also the potential for surface hydrocarbons to be ingested.

Potential effects include damage to the liver and lining of the stomach and intestine, and toxic effects on embryos (Ref. 133). Fish are most vulnerable to oil during embryonic, larval and juvenile life stages. However, very few studies have demonstrated increased mortality of fish as a result of oil spills (Ref. 134; Ref. 135; Ref. 136).

Demersal fish are not expected to be impacted given the presence of dissolved and entrained oil above impact thresholds is predicted only in the surface layers (<20 m water depth) only.

Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons are typically insufficient to cause harm (Ref. 137). Pelagic species are also generally highly mobile and as such are not likely to suffer extended exposure (e.g., >48–96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Near the sea surface, fish can detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Ref. 138). Fish that have been exposed to dissolved hydrocarbons can eliminate the toxicants once placed in clean water; hence, individuals exposed to a spill are likely to recover (Ref. 139). Marine fauna with gill-based respiratory systems, including Whale Sharks, are expected to have higher sensitivity to exposures of entrained oil. BIAs for fishes including sharks and rays that may be exposed to hydrocarbon concentrations greater than impact thresholds include: • Whale Shark (foraging). As Whale Sharks are sensitive to both in water and surface hydrocarbon exposures, deterministic analysis for the largest sea surface swept area were analysed to provide an indication of the potential exposure and possible impact. Deterministic analysis for largest sea surface swept area the maximum area for visible floating oil was predicted to occur ~1.75 days after the spill started and cover ~37 km^2. Comparing this area to the Whale Shark foraging BIA, modelling indicates that the extent of surface exposures was predicted to be limited to <1% of the entire BIA. Based on an assessment of the predicted magnitude and duration of surface oil, and both instantaneous and time-integrated entrained oil, it is expected that only a small proportion of any fish population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively. *Seabirds and shorebirds* Birds may be exposed to hydrocarbons from an oil spill at the water surface (e.g., foraging, resting) or on the shoreline (e.g., roosting, nesting). Birds that rest at the water's surface (e.g., shearwaters) or surface-plunging birds (e.g., terns, boobies) are particularly vulnerable to surface hydrocarbons (Ref. 140; Ref. 132). Damage to external tissues, including skin and eyes, can occur, along with internal tissue irritation in lungs and stomachs (Ref. 141). Acute and chronic toxic effects may result where the product is ingested as the bird attempts to preen its feathers (Ref. 141). Breeding BIAs for the Fairy Tern, Lesser Crested Tern, Roseate Tern, and Wedge-tailed Shearwater may be exposed to hydrocarbon concentrations greater than impact thresholds. The deterministic analysis for the largest volume of oil ashore (from the 3,000 m^3 nearshore trunkline release) indicates that shoreline hydrocarbons concentrations ≥100 g/m^2 are present within ~2 days following the spill event, with a maximum volume ashore of ~225 m^3. Stochastic modelling also showed that the longest length of shoreline with exposure of ≥100 g/m^2 is ~5 km. Therefore, as the extent and duration of exposure to shorelines and associated breeding environments is expected to be limited, the potential for environmental impacts would also be limited. Deterministic analysis for largest sea surface swept area the maximum area for visible floating oil was predicted to occur ~1.75 days after the spill started and cover ~37 km^2 (from the 4,000 m3 middle trunkline release). Using the Wedge-tailed Shearwater breeding BIA surrounding Thevenard Islands as an example, modelling indicates that the extent of surface exposures was predicted to be limited to <2% of the entire BIA. This information indicates that if a spill event occurred during the nesting season, it is unlikely to impact entire local nesting populations. Based on an assessment of the predicted magnitude and duration of surface and shoreline oil, it is expected that only a small proportion of any seabird population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.
Smothering of subtidal and intertidal habitats *Coral* Direct contact of hydrocarbons to coral can cause smothering, resulting in a decline in metabolic rate, and may cause varying degrees of tissue decomposition and death. A range of impacts may also result from toxicity, including partial mortality of colonies, reduced growth rates, bleaching, and reduced photosynthesis (Ref. 142; Ref. 143). Stochastic modelling predicted coral reefs associated with the following key values or sensitivities within the EMBA (Table 4-11) have the potential to be exposed to hydrocarbon concentrations above impact thresholds:

- Ningaloo Coast (World Heritage Property, National Heritage Place).

No surface exposure at the ≥10 g/m^2 impact threshold was predicted for the Ningaloo Coast area (Table 7-6). Therefore, impacts from smothering within intertidal areas due to surface oil is not expected to occur. The probability of exposure to dissolved (≥50 ppb) or entrained oil (≥100 ppb) at the Ningaloo Coast area varied (0–100%) depending on the spill location (Table 7-6); however, stochastic modelling showed all dissolved and entrained oil remained in the surface waters layers. As such, exposure to coral reefs in deeper waters at Ningaloo is not predicted to occur.

For assessment of other coral habitats that occur within the EMBA (e.g., around some of the Pilbara islands), the deterministic analysis for the largest sea surface swept area (from the 4.000 m^3 middle trunkline condensate scenario) indicates the maximum area for visible floating oil was predicted to occur ~1.75 days after the spill started and cover ~37 km^2. Given hydrocarbons are likely to wash ashore quickly in nearshore environments, exposure to intertidal habitats would likely be brief. As the extent and duration of exposure to nearshore environments is expected to be limited the potential for environmental impacts would also be limited.

Based on an assessment of the predicted magnitude and duration of surface oil, and both instantaneous and time-integrated entrained oil, it is expected that only a small proportion of any coral habitat would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause smothering was ranked as Minor (5).

Mangroves and intertidal mudflats

Shoreline hydrocarbons can have smothering and toxic effects on mangroves and intertidal mudflats. Acute and chronic impacts to the health of mangrove communities can occur via pneumatophore smothering and exposure to the toxic volatile fraction of the hydrocarbons (Ref. 144). Intertidal mudflats, which are typically sheltered and have a large surface area for oil absorption, can trap oil, potentially causing toxicity impacts to infauna. Intertidal mudflats are very sensitive to oil pollution because the oil enters lower layers of the mudflats where a lack of oxygen prevents the oil from decomposing (Ref. 144).

Mangroves and intertidal mudflats associated with key values and sensitivities (e.g., the Ningaloo Coast; Table 4-11) within the EMBA were not predicted to be exposed to shoreline hydrocarbons above impact thresholds.

For assessment of other mangrove habitats that occur within the EMBA, the deterministic analysis for the largest volume of oil ashore (from the 3,000 m^3 nearshore trunkline release) indicates that shoreline hydrocarbons concentrations ≥100 g/m^2 are present within ~2 days following the spill event, with a maximum volume ashore of ~225 m^3. Stochastic modelling also showed that the longest length of shoreline with exposure of ≥100 g/m^2 is ~5 km. Therefore, as the extent and duration of exposure to shorelines is expected to be limited the potential for environmental impacts would also be limited.

Based on an assessment of the predicted magnitude and duration of shoreline oil, it is expected that only a small proportion of any mangrove and intertidal habitat would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause smothering was ranked as Minor (5).

Indirect impacts to commercial fisheries

As identified in Section 4.4.1, several commercial fisheries have management areas and recent fishing effort recorded within the EMBA. Direct impacts commercially targeted fish species are expected to occur from in-water hydrocarbon exposures.

Stochastic modelling showed that when dissolved and entrained oil was predicted to occur above the impact thresholds, it remained in the surface layers (<20 m water depth) only. Although exposures above impact thresholds have the potential to affect the recruitment of targeted commercial and recreational fish species, any acute impacts are expected to be limited, given this event is singular, non-continuous, and will result in a limited volume of hydrocarbon being released over a short time. On this basis recruitment of targeted species is not expected to be impacted significantly given the extent of exposure to concentrations above impact thresholds are expected to be limited due to rapid dilution and dispersion upon release.

Spill events also have the potential to impact commercial fisheries through indirect impacts associated with tainting. Tainting is a change in the characteristic smell or flavour, and renders the catch unfit for human consumption or sale due to public perception. Tainting may not be a permanent condition but will persist if the organisms are continuously exposed; but when exposure is terminated, depuration will quickly occur (Ref. 145). Regardless of the small potential for tainting, customer perception that tainting has occurred may cause a larger impact then the direct impact itself. However, as this event is singular, non-continuous, and will result in a limited volume of hydrocarbon being released over a short time period, and the low persistence of the

hydrocarbon in the environment, customer perceptions are not expected to be altered for a prolonged period. Modelling predicts that inshore exposure would be limited, whilst offshore exposures are expected to dilute and disperse over a longer period of time. In both instances, it is expected that any impacts from this type of event would likely be short term in duration. Therefore, CAPL assesses the consequence to commercial fisheries as localised and short term and it is ranked as Minor (5).	
Reduction in amenity resulting in impacts to tourism and recreation Modelling predicts shoreline exposure ≥10 g/m^2 (visible impact threshold) has the potential to occur along parts of Ashburton, and several of the Pilbara inshore islands. The deterministic analysis for the largest volume of oil ashore (from the 3,000 m^3 nearshore trunkline release) indicates that shoreline hydrocarbons concentrations ≥100 g/m^2 are present within ~2 days following the spill event, with a maximum volume ashore of ~225 m^3. Stochastic modelling also showed that the longest length of shoreline with exposure of ≥100 g/m^2 is ~5 km. Therefore, as the extent and duration of exposure to shorelines is expected to be limited the potential for environmental impacts would also be limited. Shoreline loading can impact the visual amenity of coastal areas and limit beach access for users, impacting tourism and recreation activities. Although there is public access for many of the Pilbara islands, access would only be restricted for a limited time given modelling indicates the spatial and temporal extent of exposure s not expected to be prolonged. However, given the short-term and localized disturbance to marine tourism and recreation activities, CAPL has ranked the consequence as Minor (5).	
ALARP decision context justification	
The operation of subsea production systems offshore is a well-practised nationally and internationally activity. The control measures to manage the risk associated with a major defect event are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. Specifically, CAPL has worked in the region for over 10 years, and has a demonstrated understanding of industry requirements and their operational implementation in these areas. During stakeholder consultation, no objections or claims were raised regarding major defect events arising from the activity. The risks associated with a major defect event are considered lower-order risks in accordance with Table 5-3. As such, CAPL would apply ALARP Decision Context A for this aspect.	
Good practice control measures and source	
Control measure	**Source**
IM Plan	Inspections provide assurance that assets are in good condition and proactively identify maintenance or repair activities that may be required. The type and frequency of inspections of the subsea hydrocarbon system will be undertaken in accordance with the *Wheatstone Upstream Subsea System Inspection and Monitoring Plan* (Ref. 22) and *Wheatstone Upstream Trunkline System Inspection and Monitoring Plan* (Ref. 23). The IM Plan also requires that hydrocarbon system process monitoring (pressure, temperature and flow rates), fluid composition monitoring, and corrosion monitoring are undertaken. Inspection and monitoring results are assessed against acceptance criteria to allow early identification and management of potential anomalies through engineering assessment, maintenance, and repairs to ensure the integrity of the hydrocarbon system and prevent a loss of containment. Inspections are tracked via the Computerised Maintenance Management System (CMMS).
Source control	Source control is part of the first actions taken to minimise the volume of hydrocarbon released and therefore reduce potential impacts and risks to the environment. CAPL has developed Emergence Operating Procedures (EOPs) (Ref. 76) that provides guidance to operations personnel to detect,

	isolate and stabilise non-routine events such as trunkline/flowline loss of containment scenarios.	
OPEP	Under the OPGG(E)R, NOPSEMA require that the petroleum activity have an accepted OPEP in place before commencing the activity. If a major defect occurs, the OPEP will be implemented. CAPL has developed an NOPSEMA-accepted OPEP (Ref. 2) to support all spill response activities across all its assets.	
OSMP	The OSMP details the arrangements and capability in place for operational and scientific monitoring. Operational monitoring collects information about the oil spill to aid planning and decision making for executing spill response or clean-up operations. Scientific monitoring focuses on the environmental impact attributable to the spill or the associated response activities and informs requirements for remediation (if required). CAPL has developed an NOPSEMA-accepted OSMP (Ref. 3) to support all spill monitoring activities across all its assets.	
Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A
Likelihood and risk level summary		
Likelihood	Analysis of the 2001 PARLOC database (Ref. 146) was used to evaluate the likelihood of a loss of containment from an individual offshore pipeline, which was determined to be equivalent to 0.189% per year (Ref. 147). This frequency was used as a guide to inform the likelihood of consequence. Because of the low probability of a major defect event, the likelihood of the event coinciding with the breeding or migration period of particular values and sensitivities, and the control measures in place, the likelihood of the worst-case environmental consequence occurring as described above was assessed as Remote (5).	
Risk level	Very low (9)	
Determination of acceptability		
Principles of ESD	The potential impact associated with this aspect would be short term, apply to some individuals, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	Legislation and other requirements relevant for this aspect include: • *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • Conservation Advice *Megaptera novaeangliae* Humpback Whale (Ref. 98) • *Conservation Advice Balaenoptera borealis Sei Whale* (Ref. 99) • *Conservation Advice Balaenoptera physalus Fin Whale* (Ref. 97) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94)	

	• North-west Marine Parks Network Management Plan (Ref. 148).
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • IM Plans (Ref. 22; Ref. 23) • OPEP (Ref. 2) • OSMP (Ref. 3).
External context	During stakeholder consultation, no objections or claims were raised regarding major defect events arising from the activity.
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that chemical discharge and/or pollution (of which an oil spill is a component) is listed as a threat to protected matters under documents made or implemented under the EPBC Act, CAPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Recovery Plan for Marine Turtles in Australia* (Ref. 94) specifies the following relevant action areas and action: • minimise chemical and terrestrial discharge • ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly in reference to 'slow to recover habitats', e.g. nesting habitat, seagrass meadows or coral reefs. CAPL addresses spill response and monitoring within their OPEP (Ref. 2) and OSMP (Ref. 3). No other specific relevant actions were identified within other documents implemented under the EPBC Act. Therefore, CAPL has defined an acceptable level of impact as minimising the risk of impacts to the environment from spills from major defect events.

Environmental performance outcome	Performance standard / Control measure	Measurement criteria
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**IM Plan** Inspection and maintenance will include, but not be limited to, visual or acoustic survey of the trunkline, in accordance with the IM Plan	CMMS records confirm a visual or acoustic survey of the subsea pipeline was undertaken in accordance with the IM Plan
	IM Plan Monitoring of hydrocarbon system pressure, temperature, flow rates and fluid composition against acceptable criteria and limits will be aligned with the IM Plan	Records confirm monitoring of hydrocarbon system pressure, temperature, flow rates and fluid composition against acceptable criteria and limits are aligned with the IM Plan
	Source control The isolation steps of the source control / isolation procedures implemented within 30 minutes if a spill	Records demonstrate relevant isolation components of the source control procedures are implemented if a spill is detected from the hydrocarbon system

	is detected from the hydrocarbon system	
	OPEP In the event of a spill occurring, the OPEP will be implemented	Records confirm the OPEP has been implemented
	OSMP In the event of a spill occurring, the OSMP will be implemented	Records confirm the OSMP has been implemented

7.2 Unplanned release—vessel collision event

7.2.1 Credible scenario

A vessel collision event within the OA is considered a credible (but unlikely) unplanned event. A major marine spill because of vessel collision is only likely to occur under exceptional circumstances (e.g., loss of DP, navigational error, inclement weather conditions). Given the location, water depths, and lack of submerged features within most of the OA, grounding is not considered credible, and is not considered further.

Based upon the types of vessels typically used for IMR activities (with the exception of major repairs), size of largest fuel tanks and fuel type to be utilised for the activities in this EP, CAPL was able to identify the typical credible worst-case scenario (as per AMSA guidelines; Ref. 149) as being a surface release of ~325 m^3 of MDO resulting from a vessel collision event. However, in the event that major repairs are undertaken, larger vessels would be required. Typical fuel tank sizes associated with construction or heavy lift vessels are expected to be in the order of ~1,000 m^3. Therefore, as a conservative approach to risk assessment for activities covered under this EP, these higher volumes have been used in the following analyses.

7.2.2 Spill Modelling

CAPL commissioned RPS to conduct spill modelling to inform the risk assessment associated with a vessel collision event (Ref. 150).

The release location selected for use, while outside the OA for this EP, is considered an appropriate and conservative approach to inform the risk assessment given that the modelled release location is closer to sensitive shorelines.

A three-dimensional oil spill model (SIMAP) was used to simulate the drift, spread, weathering and fate of the spilled oil (Ref. 150). Modelling was conducted using a stochastic approach, where multiple simulations (using the same spill parameters) were conducted, but under varying meteorological and oceanographic conditions.

Table 7-7 summarises the model settings; Table 7-8 summarises the hydrocarbon properties for MDO; and and Table 7-4 and Table 7-5 (in Section 7.1) describe the modelled environmental exposure and impact thresholds respectively

Table 7-7: Vessel collision spill scenario model settings

Parameter	Details
Release location	~17 km south of OA (field), and within the Montebello Marine Park

Parameter	Details
Latitude	20°09'22" S
Longitude	115°24'11" E
Water depth	~50–60 m
Oil type	MDO
Simulation spill type	Surface
Simulation spill volume	1,063 m^3 (based on the largest single tank)
Simulation spill duration	24 hours
Total simulation duration	50 days
Number of randomly selected spill simulation start times	100 per season (300 total)
Seasons modelled	Summer (December to February) Transitional (March, October, November) Winter (April to September)

Table 7-8: Physical properties and boiling point ranges for MDO

Characteristic	Value			
Density	829.1 kg/m3 (at 25 °C)			
Dynamic viscosity	4 cP			
Pour point	-14 °C			
API gravity	37.6 API			
Classification	Group II, light persistent oil			
Boiling point	Volatile <180 °C	Semi-volatile 180–265 °C	Low volatility 265–380 °C	Residual >380 °C
	6.0%	34.6%	54.4%	5.0%

7.2.2.1 Weathering and fate

MDO is a light-persistent fuel oil used in the maritime industry. It has a density of 829.1 kg/m^3, an API of 37.6, and a low pour point (−14 °C) (Table 7-6). The low viscosity (4 cP) indicates that this oil will spread quickly when released and will form a thin film on the sea surface, increasing the evaporation rate.

Generally, about 6.0% of the MDO mass should evaporate within the first 12 hours (boiling point <180 °C); a further 34.6% should evaporate within the first 24 hours (boiling point 180°C–265 °C); and an additional 54.4% should evaporate over several days (boiling point 265°C–380 °C). Approximately 5% (by mass) of MDO will not evaporate at atmospheric temperatures. These compounds will persist in the environment.

While MDO will typically remain on the water surface (where it is subject to evaporation), it is noted that some of the heavy components have a strong tendency to physically entrain into the upper water column in the presence of moderate winds (i.e. >12 knots) and breaking waves but can re-float to the surface if these energies abate (Ref. 150).

7.2.2.2 Modelling outputs

Stochastic modelling outputs from RPS (Ref. 150) are summarised in Table 7-9 having regard to the particular values and sensitivities identified in Section 4.

For the 1,063 m^3 MDO release south of the OA:

- The maximum distance from the release location to the ≥1 g/m^2 visible impact threshold was ~64 km south-southwest (transitional), and ~38 km south-southwest (summer) for the ≥10 g/m^2 impact threshold.
- The probability of contact to any shoreline at ≥10 g/m^2 was 7% in summer, 1% in winter, and no contact predicted in transitional months. The minimum time before shoreline contact was ~3 days and the maximum volume of oil ashore was 24.4 m^3. The maximum length of shoreline exposed at ≥10 g/m^2 was ~27 km, and at ≥100 g/m^2 was ~10 km.
- No dissolved oil at ≥50 ppb impact thresholds was predicted to occur during any season.
- Entrained oil at ≥100 ppb impact thresholds was predicted to occur. However, entrained oil was predicted to remain in the surface layers, with no exposure at depths >10 m below the surface predicted to occur during any season.

Table 7-9: Vessel collision spill modelling EMBA receptor exposure summary

Sensitivity	Name	Surface^		In-water (dissolved)^	In-water (entrained)^	Shoreline^	
		≥1 g/m²	≥10 g/m²	≥50 ppb	≥100 ppb	≥10 g/m²	≥100 g/m²
		(probability of exposure, minimum time to exposure)		(probability of exposure)	(probability of exposure)	(probability of exposure, minimum time to exposure, mean length of shoreline)	
AMP	Gascoyne	—	—	—	1–4%	—	—
	Montebello	100%, ~1 hour	100%, ~1 hour	—	89–97%	—	—
	Ningaloo	—	—	—	0–1%	—	—
KEF	Ancient coastline at 125 m depth contour	0–6%, ~0.75 days	—	—	19–30%	—	—
	Canyons linking the Cuvier Abyssal Plain and the Cape Range Peninsula	—	—	—	1–4%	—	—
	Commonwealth waters adjacent to Ningaloo Reef	—	—	—	0–1%	—	—
	Continental slope demersal fish communities	0–1%, ~2.7 days	—	—	9–27%	—	—
	Exmouth Plateau	—	—	—	0–2%	—	—
	Glomar Shoals	—	—	—	0–2%	—	—
World Heritage Properties / National Heritage Places	The Ningaloo Coast *(inferred from Cape Range IBRA, and Exmouth shoreline)*	—	—	—	0–2%	0–2%, ~14.4 days, ~3 km	—
Commonwealth Heritage Properties	Ningaloo Marine Area – Commonwealth Waters *(inferred from Ningaloo IMCRA)*	—	—	—	1–2%	—	—

^ Ranges in values shown are due to the different results between seasons.

7.2.3 Risk assessment

Source			
Activities identified as having the potential to result in a vessel collision event are: • vessels and IMR operations within the OA. A vessel collision event may occur as a result of a loss of DP, navigational error or floundering due to weather.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	The potential environmental impacts associated with hydrocarbon exposures from a vessel collision event are:	
		• marine pollution resulting in sublethal or lethal effects to marine fauna	5
		• smothering of subtidal and intertidal habitats	5
		• indirect impacts to commercial fisheries	5
		• reduction in amenity resulting in impacts to tourism and recreation.	5

Consequence evaluation

Marine pollution resulting in sublethal or lethal effects to marine fauna

Marine mammals

Marine mammals may be exposed to hydrocarbons from an oil spill at the water surface or within the water column. Marine mammals can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (Ref. 126; Ref. 127).

Direct contact with hydrocarbons may result in skin and eye irritation, burns to mucous membranes of eyes and mouth, and increased susceptibility to infection (Ref. 128). However, direct contact with surface oil is considered to have little deleterious effect on whales, possibly due to the skin's effectiveness as a barrier. Furthermore, effect of oil on cetacean skin is probably minor and temporary (Ref. 128). French-McCay (Ref. 129) identifies that a ≥10 g/m^2 oil thickness threshold has the potential to impart a lethal dose to the species; however, also estimates a probability of 0.1% mortality to cetaceans if they encounter these thresholds based on the proportion of the time spent at surface.

The physical impacts from ingested hydrocarbons with subsequent lethal or sublethal impacts are applicable; however, the susceptibility of cetaceans varies with feeding habits. Baleen whales are not particularly susceptible to ingestion of oil in the water column as they feed by skimming the surface (i.e., they are more susceptible to surface slicks). Toothed whales and dolphins may be susceptible to ingestion of dissolved and entrained oil as they gulp feed at depth. As highly mobile species, in general it is very unlikely that these animals will be constantly exposed to concentrations of hydrocarbons in the water column for continuous durations (e.g., >48–96 hours) that would lead to chronic effects.

Studies have shown little impact on Bottlenose Dolphins after hydraulic and mineral oil immersion and ingestion, although there was evidence of temporary skin damage in dolphins and a Sperm Whale from contact with various oil products including crude oil (Ref. 128; Ref. 130).

Marine mammals are vulnerable if they inhale volatiles when they surface within a hydrocarbon slick. For the short period that they persist, vapours from the spill are a significant risk to mammal health, with the potential to damage mucous membranes of the airways and the eyes, which will reduce the health and potential survivability of an animal. Inhaled volatile hydrocarbons are transferred rapidly to the bloodstream and may also accumulate in tissues (Ref. 128).

Stochastic modelling was used to identify BIAs for marine mammals that may be exposed to hydrocarbon concentrations greater than impact thresholds within the EMBA. These were:

- Humpback Whale (migration, resting)
- Pygmy Blue Whale (distribution, migration, foraging)
- Dugongs (breeding, calving, foraging, nursing).

As these species are considered most sensitive to surface exposures, deterministic analyses were utilised to understand the potential extent and duration of exposure.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <5 days following the spill event, with a maximum area of coverage of ~99 km^2 occurring 18 hours after the spill commenced. This deterministic scenario is considered most relevant for offshore waters, and subsequent impacts to offshore BIA's in those regions. Using the Pygmy Blue Whale migration BIA as an example, modelling indicates that the extent of surface exposures was predicted to be limited to <1% of the entire BIA.

The deterministic model for the worst-case trajectory for Ningaloo World Heritage area indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <2 days following the spill event, with a maximum area of coverage of ~32 km^2 occurring 18 hours after the spill commenced. This deterministic scenario is considered most relevant for nearshore waters around Ningaloo and Exmouth Gulf, and subsequent impacts to nearshore BIA's in those regions. Using the Dugong breeding BIA as an example, modelling indicates that the extent of surface exposures was predicted to be limited to <1% of the entire BIA. As the extent and duration of exposure to nearshore environments is expected to be limited the potential for environmental impacts would also be limited. However, it is acknowledged that behaviours in nearshore waters are likely to result in increased sensitivity to hydrocarbon exposures as species are less likely to be transient.

Based on an assessment of the predicted magnitude and duration of surface oil, and entrained oil, it is expected that only a small proportion of any marine mammal population would be exposed above the defined impact exposure thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Reptiles

Marine reptiles may be exposed to hydrocarbons from an oil spill at the water surface or on the shoreline. Marine reptiles can be exposed to oil externally (e.g., swimming through surface slick) or internally (e.g., swallowing the oil, consuming oil-affected prey, or inhaling of volatile oil related compounds) (Ref. 131).

Marine turtles are vulnerable to the effects of oil at all life stages: eggs, hatchlings, juveniles, and adults. Several aspects of turtle biology and behaviour place them at risk, including a lack of avoidance behaviour, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Ref. 132). Oil effects on turtles can include impacts to the skin, blood, digestive, and immune systems, and increased mortality due to oiling.

Shoreline hydrocarbons can impact turtles coming ashore at nesting beaches. Eggs may also be exposed during incubation, potentially resulting in increased egg mortality and detrimental effects on hatchlings. Hatchlings may be particularly vulnerable to toxicity and smothering as they emerge from the nests and make their way over the intertidal area to the water (Ref. 131).

BIAs for the Flatback Turtle, Loggerhead Turtle, Green Turtle, and Hawksbill Turtle may be exposed to hydrocarbon concentrations greater than the impact thresholds. The behaviours associated with these BIAs include aggregation, basking, foraging, internesting, mating, and nesting.

Montebello Islands was the only area predicted to be exposed to shoreline hydrocarbons accumulation of ≥100 g/m^2. These islands are identified as habitat critical to the survival of Flatback, Green and Hawksbill turtles (Table 4-4). As such nesting adult turtles and hatchlings may be exposed as they traverse the intertidal area, resulting in potential smothering and acute impacts to some hatchlings during that nesting season.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <5 days following the spill event, with a maximum area of coverage of ~99 km^2 occurring 18 hours after the spill commenced. This deterministic run also predicted the largest volume of oil ashore as ~24 m^3, and the maximum length of shoreline exposed to ≥100 g/m^2 was ~10 km occurring ~4 days after the spill commenced. Using the Flatback Turtle internesting and nesting BIAs around Montebello Islands as an example, modelling indicates that the extent of surface and shoreline exposures was predicted to be limited to <1% of the entire BIA, or <1% of the coastline. This information indicates that if a vessel spill event occurred during the nesting season, it is unlikely to impact entire local nesting populations.

Based on an assessment of the predicted magnitude and duration of surface and shoreline oil, it is expected that only a small proportion of any marine reptile population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Fishes, including sharks and rays

Fish, including sharks and rays, may be exposed to hydrocarbons from an oil spill within the water column. Most fish do not break the sea surface, and therefore the risk from surface oil is not relevant; however, some shark species (including Whale Sharks) feed in surface waters, so there is also the potential for surface hydrocarbons to be ingested.

Potential effects include damage to the liver and lining of the stomach and intestine, and toxic effects on embryos (Ref. 133). Fish are most vulnerable to oil during embryonic, larval and juvenile life stages. However, very few studies have demonstrated increased mortality of fish as a result of oil spills (Ref. 134; Ref. 135; Ref. 136).

Demersal fish are not expected to be impacted given the presence of entrained oil ≥100 ppb is predicted in the surface layers (<10 m water depth) only.

Pelagic free-swimming fish and sharks are unlikely to suffer long-term damage from oil spill exposure because dissolved/entrained hydrocarbons are typically insufficient to cause harm (Ref. 137). Pelagic species are also generally highly mobile and as such are not likely to suffer extended exposure (e.g., >48–96 hours) at concentrations that would lead to chronic effects due to their patterns of movement. Near the sea surface, fish can detect and avoid contact with surface slicks meaning fish mortalities rarely occur in the event of a hydrocarbon spill in open waters (Ref. 138). Fish that have been exposed to dissolved hydrocarbons can eliminate the toxicants once placed in clean water; hence, individuals exposed to a spill are likely to recover (Ref. 139). Marine fauna with gill-based respiratory systems, including Whale Sharks, are expected to have higher sensitivity to exposures of entrained oil.

BIAs for fishes including sharks and rays that may be exposed to hydrocarbon concentrations greater than impact thresholds include:

- Whale Shark (foraging).

As these species are considered most sensitive to surface exposures, deterministic analyses were utilised to understand the potential extent and duration of exposure.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <5 days following the spill event, with a maximum area of coverage of ~99 km^2 occurring 18 hours after the spill commenced. This deterministic scenario is considered most relevant for offshore waters, and subsequent impacts to offshore BIA's in those regions. Using the Whale Shark foraging BIA, modelling indicates that the extent of surface exposures was predicted to be limited to <1% of the entire BIA.

Based on an assessment of the predicted magnitude and duration of surface oil, and both instantaneous and time-integrated entrained oil, it is expected that only a small proportion of any fish population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Seabirds and shorebirds

Birds that rest at the water's surface (e.g., shearwaters) or surface-plunging birds (e.g., terns, boobies) are particularly vulnerable to surface hydrocarbons (Ref. 140; Ref. 132). Damage to external tissues, including skin and eyes, can occur, along with internal tissue irritation in lungs and stomachs (Ref. 141). Acute and chronic toxic effects may result where the product is ingested as the bird attempts to preen its feathers (Ref. 141).

Breeding BIAs for the Fairy Tern, Lesser Crested Tern, Roseate Tern, and Wedge-tailed Shearwater may be exposed to hydrocarbon concentrations greater than impact thresholds.

Montebello Islands was the only area predicted to be exposed to shoreline hydrocarbons accumulation of ≥100 g/m^2.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <5 days following the spill event, with a maximum area of coverage of ~99 km^2 occurring 18 hours after the spill commenced. This deterministic run also predicted the largest volume of oil ashore as ~24 m^3, and the maximum length of shoreline exposed to ≥100 g/m^2 was ~10 km occurring ~4 days after the spill commenced. Using the Wedge-tailed Shearwater breeding BIA around Montebello Islands as an example, modelling indicates that the extent of surface and shoreline exposures was predicted to be limited to <1% of the entire BIA, or <1% of the coastline. This information indicates that if a vessel spill event occurred during breeding season, it is unlikely to impact entire local nesting populations.

Based on an assessment of the predicted magnitude and duration of surface and shoreline oil, it is expected that only a small proportion of any seabird population would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause sublethal or lethal effects was ranked as Incidental (6) and Minor (5), respectively.

Smothering of subtidal and intertidal habitats

Coral, seagrass and macroalgae

The effects of physical contact on subtidal habitats are similar, and studies have shown that it can cause sublethal stress and reduced growth rates in seagrass (Ref. 151; Ref. 152), act as a barrier to diffusion of CO_2 across cell walls in macroalgae (Ref. 153), and a decline in metabolic rate and partial mortality in corals (Ref. 154; Ref. 155) and impair respiration and photosynthesis by symbiotic zooxanthellae (Ref. 156; Ref. 157). The recovery of benthic habitats can be slow, with studies following the Deepwater Horizon incident showing long-term non-acute effects of the spill on coral colonies seven years after the event (Ref. 158).

Stochastic modelling predicted coral reefs associated with the following key values or sensitivities within the EMBA (Table 4-11) have the potential to be exposed to hydrocarbon concentrations above impact thresholds:

- Ningaloo Coast (World Heritage Property, National Heritage Place).

Coral, seagrass, and macroalgae habitats are also known to occur around the Barrow and Montebello islands, and to a smaller extent around some of the other Pilbara inshore islands.

Stochastic modelling showed that in-water (entrained) hydrocarbons were predicted to remain within the surface layers only. Therefore, exposure to coral reefs in deeper waters are not predicted to occur. However, smothering of benthic habitat communities may occur if a surface slick occurs in the intertidal area.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <5 days following the spill event, with a maximum area of coverage of ~99 km^2 occurring 18 hours after the spill commenced. This deterministic run also predicted the largest volume of oil ashore as ~24 m^3, and the maximum length of shoreline exposed to ≥100 g/m^2 was ~10 km occurring ~4 days after the spill commenced.

The deterministic model for the worst-case trajectory for Ningaloo World Heritage area indicates that surface hydrocarbons concentrations ≥1 g/m^2 (i.e., visible threshold) are present for <2 days following the spill event, with a maximum area of coverage of ~32 km^2 occurring 18 hours after the spill commenced.

These deterministic scenarios are considered most relevant for nearshore waters and subsequent impacts to nearshore corals. Therefore, as the extent and duration of exposure to nearshore environments is expected to be limited the potential for environmental impacts would also be limited.

Based on an assessment of the predicted magnitude and duration of surface oil, and both instantaneous and time-integrated entrained oil, it is expected that only a small proportion of any coral habitat would be exposed above the defined impact thresholds. Therefore, the potential impacts of oil to cause smothering was ranked as Minor (5).

Mangroves and intertidal mudflats

Shoreline hydrocarbons can have smothering and toxic effects on mangroves and intertidal mudflats. Acute and chronic impacts to the health of mangrove communities can occur via pneumatophore smothering and exposure to the toxic volatile fraction of the hydrocarbons (Ref. 144). Intertidal mudflats, which are typically sheltered and have a large surface area for oil absorption, can trap oil, potentially causing toxicity impacts to infauna. Intertidal mudflats are very sensitive to oil pollution because the oil enters lower layers of the mudflats where a lack of oxygen prevents the oil from decomposing (Ref. 144).

Stochastic modelling predicted shoreline accumulation above the ≥100 g/m^2 impact threshold may occur at Montebello Islands during summer; but no accumulation ≥1,000 g/m^2 was predicted to occur. This higher threshold is typically associated with impacts to coastal vegetation communities (Table 7-5), and therefore, shoreline exposure to mangroves and intertidal mudflats is not discussed further.

Indirect impacts to commercial fisheries

As identified in Section 4.4.1, several commercial fisheries have management areas and recent fishing effort recorded within the EMBA. Direct impacts commercially targeted fish species are expected to occur from in-water exposures.

Stochastic modelling showed that there no dissolved oil above impact thresholds (≥50 ppb) was predicted to occur during any season. Entrained oil above impact thresholds (≥100 ppb) was predicted to occur; however, was predicted to remain in the surface layers, with no exposure at depths >10 m below the surface predicted to occur during any season.

Although exposures above impact thresholds have the potential to affect the recruitment of targeted commercial and recreational fish species, any acute impacts are expected to be limited, given this event is singular, non-continuous, and will result in a limited volume of hydrocarbon being released over a short time. On this basis recruitment of targeted species is not expected to be impacted significantly given the extent of exposure to concentrations above impact thresholds are expected to be limited due to rapid dilution and dispersion upon release.

Spill events also have the potential to impact commercial fisheries through indirect impacts associated with tainting. Tainting is a change in the characteristic smell or flavour, and renders the catch unfit for human consumption or sale due to public perception. Tainting may not be a permanent condition but will persist if the organisms are continuously exposed; but when exposure is terminated, depuration will quickly occur (Ref. 145). Regardless of the small potential for tainting, customer perception that tainting has occurred may cause a larger impact then the direct impact itself. However, as this event is singular, non-continuous, and will result in a limited volume of hydrocarbon being released over a short time period, and the low persistence of the hydrocarbon in the environment, customer perceptions are not expected to be altered for a prolonged period.

Modelling predicts that inshore exposure would be limited, whilst offshore exposures are expected to dilute and disperse over a longer period of time. In both instances, it is expected that any impacts from this type of event would likely be short term in duration. Therefore, CAPL assesses the consequence to commercial fisheries as localised and short term and it is ranked as Minor (5).

Reduction in amenity resulting in impacts to tourism and recreation

Modelling predicts shoreline exposure ≥10 g/m^2 (visible impact threshold) from a vessel spill event during summer has the potential to occur predominantly along Montebello and Barrow Islands, with smaller/patchier occurrences along some of the other Pilbara inshore islands and North West Cape coast, depending on the environmental conditions at the time of the event. Only a small area of Montebello Island was predicted to be exposed during winter, and no shoreline contact was predicted to occur during transitional) seasons.

The deterministic model for the worst-case trajectory for Montebello Islands indicates that the maximum length of shoreline oil above the visible impact threshold (≥10 g/m^2) at any given time was ~23 km, and the maximum volume of oil ashore was ~24 m^3.

Shoreline loading can impact the visual amenity of coastal areas and limit beach access for users, impacting tourism and recreation activities. However, given the short-term and localized disturbance to marine tourism and recreation activities, CAPL has ranked the consequence as Minor (5).

ALARP decision context justification

Support vessels commonly operate near each other during offshore surveys, and these activities are well-practised nationally and internationally.

The control measures to manage the risk associated with vessel collisions are well defined via legislative requirements that are considered standard industry practice. These are well understood and implemented by the petroleum industry and CAPL. Specifically, CAPL has worked in the region for over 10 years, and has a demonstrated understanding of industry requirements and their operational implementation in these areas.

During stakeholder consultation, no objections or claims were raised regarding vessel collision scenarios arising from the activity.

The risks associated with a vessel collision are considered lower-order risks in accordance with Table 5-3. As such, CAPL would apply ALARP Decision Context A for this aspect.

Good practice control measures and source	
Control measure	**Source**
Marine Safety Reliability and Efficiency (MSRE) process	CAPL's *ABU MSRE Corporate OE Process* (Ref. 53) ensures that various legislative requirements are met. These include: • crew meet the minimum standards for safely operating a vessel, including watchkeeping requirements • navigation, radar equipment, and lighting meets industry standards. These requirements will ensure that direct vessel radio contact is available to other marine users operating in this area to enable ease of communication in highlighting risks and nearby exclusion zones.
Maritime safety information	Maritime safety information, such as AUSCOAST navigational warnings, are issued by the Joint Rescue Coordination Centre (JRCC) Australia, part of AMSA. Under the *Navigation Act 2012*, the AHO is also responsible for maintaining and disseminating navigational charts and publications, including providing safety-critical information to mariners (including any change to prohibited/restricted areas, obstructions to surface navigation, etc.) via the Notice to Mariners system. Notice to Mariners can be permanent or temporary notifications. Where required for an IMR activities, AUSCOAST and/or Notice to Mariners will be issued; thus enabling other marine users to also safely plan their activities.
SOPEP / Shipboard Marine Pollution Emergency Plan	MARPOL 73/78 Annex I and Marine Order 91 (Marine pollution prevention – oil) requires that each vessel has an approved SOPEP in place. To prepare for a spill event, the SOPEP details: • response equipment available to control a spill event • review cycle to ensure that the SOPEP is kept up to date • testing requirements, including the frequency and nature of these tests. In the event of a spill, the SOPEP details: • reporting requirements and a list of authorities to be contacted • activities to be undertaken to control the discharge of oil procedures for coordinating with local officials.
OPEP	Under the OPGG(E)R, NOPSEMA require that the petroleum activity have an accepted OPEP in place before commencing the activity. If a vessel collision occurs, the OPEP will be implemented. CAPL has developed an NOPSEMA-accepted OPEP (Ref. 2) to support all spill response activities across all its assets.
OSMP	The OSMP details the arrangements and capability in place for operational and scientific monitoring. Operational monitoring collects information about the oil spill to aid planning and decision making for executing spill response or clean-up operations. Scientific monitoring focuses on the environmental impact attributable to the spill or the associated response activities and informs requirements for remediation (if required). CAPL has developed an NOPSEMA-accepted OSMP (Ref. 3) to support all spill monitoring activities across all its assets.

Additional control measures and cost benefit analysis		
Control measure	**Benefit**	**Cost**
N/A	N/A	N/A

Likelihood and risk level summary	
Likelihood	Based on industry data, vessel collisions are considered rare, with only 3% of all marine incidents that occurred in Australian waters between 2005 and 2012 associated with a vessel collision event. As most vessel collisions involve the LOC of a forward tank, which are generally double-lined and smaller than other tanks, the loss of the maximum credible volumes used in this scenario is unlikely. Considering the inherent low likelihood of a collision occurring, the safeguards in place, and enactment of the OPEP, the potential likelihood of causing the consequences described in this section is Remote (5)
Risk level	Very Low (9)
Acceptability summary	
Principles of ESD	The potential impact associated with this aspect would be short term, apply to some individuals, and consequently is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.
Relevant environmental legislation and other requirements	Legislation and other requirements relevant for this aspect include: • Commonwealth *Navigation Act 2012* • Marine Order 91, Marine Pollution Prevention – oil • Marine Order 30, Prevention of collisions • *Conservation Management Plan for the Blue Whale 2015–2025* (Ref. 100) • Conservation Advice *Megaptera novaeangliae Humpback Whale* (Ref. 98) • *Conservation Advice Balaenoptera borealis Sei Whale* (Ref. 99) • *Conservation Advice Balaenoptera physalus Fin Whale* (Ref. 97) • *Conservation Advice Rhincodon typus Whale Shark* (Ref. 96) • *Recovery Plan for Marine Turtles in Australia* (Ref. 94) • North-west Marine Parks Network Management Plan (Ref. 148).
Internal context	These CAPL environmental performance standards or procedures were deemed relevant for this aspect: • MSRE process (Ref. 53) • OPEP (Ref. 2) • OSMP (Ref. 3).
External context	During stakeholder consultation, no objections or claims were raised regarding a vessel collision event arising from the activity.
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan. However, given that chemical discharge and/or pollution (of which an oil spill is a component) is listed as a threat to protected matters under documents made or implemented under the EPBC Act, CAPL has defined an acceptable level of impact such that it is not inconsistent with these documents. The *Recovery Plan for Marine Turtles in Australia* (Ref. 94) specifies the following relevant action areas and action: • minimise chemical and terrestrial discharge • ensure spill risk strategies and response programs adequately include management for marine turtles and their habitats, particularly

	in reference to ‘slow to recover habitats’, e.g. nesting habitat, seagrass meadows or coral reefs. No other specific relevant actions were identified within other documents implemented under the EPBC Act. CAPL addresses spill response and monitoring within their OPEP (Ref. 2) and OSMP (Ref. 3). Therefore, CAPL has defined an acceptable level of impact as minimising the risk of impacts to the environment from spills from vessel operations.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the environment from the unplanned release of hydrocarbons / hazardous materials during petroleum activities	**MSRE process** Vessels will meet the crew competency, navigation equipment, and radar requirements of the MSRE process	Records indicate that vessels meet the crew competency, navigation equipment, and radar requirements of the MSRE process
	Maritime safety information Where required, Notice to Mariners and/or AUSCOAST warnings are issued prior to commencing offshore IMR work	Record of lodgement of notification to relevant agency
	SOPEP Marine vessels >400 T will carry on board a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with MARPOL 73/78 Annex I – Prevention of Oil Pollution	OVIS report / ABU Marine OE Inspection Checklist confirms an approved SOPEP is on board marine vessels >400 T
		Inspection records (or similar) show drills conducted in accordance with SOPEP
	SOPEP In the event of a vessel-based spill event, emergency response activities will be implemented in accordance with the vessel SOPEP (or equivalent).	Records confirm that emergency response activities were implemented in accordance with the vessel SOPEP in the event of a vessel-based spill.
	OPEP In the event of a spill occurring, the OPEP will be implemented	Records confirm the OPEP has been implemented
	OSMP In the event of a spill occurring, the OSMP will be implemented	Records confirm the OSMP has been implemented

7.3 Spill response

7.3.1 Response option selection

7.3.1.1 Strategic NEBA

CAPL has developed a series of Strategic Net Environmental Benefit Analysis (NEBAs) (Ref. 159) using generalised scenarios that reflect the spill risks associated with all CAPL offshore WA operations. Hydrocarbons associated with spill events from all CAPL operations were grouped into oil types as defined by the International Tanker Owners Pollution Federation Ltd (ITOPF) classification system:

- Group 1 – including Iago, Wheatstone, and Jansz condensate; Wheatstone trunkline fluids; and Wheatstone flowline fluids
- Group 2 – including MDO, Gorgon condensate, Barrow Island crude, and Gorgon/Jansz mixed trunkline fluids
- Group 3 / 4 – including HFO and intermediate fuel oil (IFO) (depending on blend).

These NEBAs were developed as a pre-spill planning tool for all CAPL EPs, to facilitate response option selection and support the development of the overall response strategies by identifying and comparing the potential effectiveness and impacts of oil spill response options (Ref. 160). After considering the benefits and drawbacks of each response option on the ecological, social, and economic receptors within the EMBA, the response options that were determined to minimise the impacts to the environment and people were pre-selected.

7.3.1.2 Protection prioritisation process

CAPL has developed a Protection Prioritisation Process (PPP) (Ref. 161) to support decision making in the event of a significant spill event. The information within the PPP document is used to identify priorities for protection within the activity specific spill scenario(s) EMBA, such as that described in Section 4. The identification of priorities for protection assists in the identification of resources to be assessed within the strategic and operational NEBAs, as described above. The NEBA considers the protection priority values, the EMBA, and the various control measures, including their feasibility, likely success, environmental benefits, level of effectiveness and performance of response tactics. The output of the NEBA and the protection priorities identified will then guide the strategic direction of the response through informing decisions made around tactical planning and response option selection.

The PPP (Ref. 161) ranks receptors (natural or anthropogenic value or resource that is potentially sensitivity to marine oil pollution) using a 5 level scale (from Very Low (1) to Very High (5)) based on a number of factors, including their sensitivity and vulnerability to oil, their conservation status and the biological and socioeconomic importance of the receptor. The CAPL PPP (Ref. 161) aligns with WA Department of Transport (DoT) PPP (Ref. 162) and utilises the same shoreline cells to illustrate broad scale identification of sensitive areas.

Areas with high value receptors and at greatest risk of contact with oil (as indicated by stochastic modelling) are assigned a high protection priority and designated as priority planning areas. The process for identifying these areas (described in the PPP document [Ref. 161]) considers all High (4) and Very High (5) ranked shoreline cells where contact above the moderate exposure threshold (from stochastic modelling across all seasons) is predicted within 4 days (96 hours). As described in the PPP (Ref. 161), the 4-day contact timeframe is based on the expected time it would take CAPL to develop and implement a Tactical Response Guide (TRG) for an area predicted to be impacted. For contact outside this timeframe, it expected that CAPL will have reasonable time to develop and implement a TRG prior to oil contacting the resource.

High and Very High value areas (DoT shoreline cells) identified for contact within this timeframe have been identified in Table 7-10 and Table 7-11 for the major defect and vessel collision events respectively. These priority planning areas, and the specific receptors identified within them, are considered to ensure that tactical planning and response option selection are appropriate.

Table 7-10: Priority panning areas for major defect spill scenario

Potential area of impact	Distance from source of spill	Shoreline values	Planned response tactics
DoT Shoreline Cell # 115 (Ashburton, Ashburton Island, Tortoise Island, Locker Island)	<2km	Turtles – BIAs including nesting Seabirds – BIAs including breeding Mangrove communities Coral and reef communities State and Commonwealth Managed Fisheries	Monitor, Evaluation and Surveillance Shoreline Protection and Deflection Shoreline Clean-up Oiled Wildlife Response
DoT Shoreline Cell # 326 (Serrurier Island, Flat Island, Table Island, Round Island)	20km	Turtles – BIAs including nesting Seabirds – BIAs including breeding Coral and reef communities State and Commonwealth Managed Fisheries	Monitor, Evaluation and Surveillance Shoreline Protection and Deflection Shoreline Clean-up Oiled Wildlife Response
DoT Shoreline Cell # 325 (Thevenard Island)	13km	Turtles – BIAs including nesting Seabirds – BIAs including breeding Coral and reef communities State and Commonwealth Managed Fisheries Tourism	Monitor, Evaluation and Surveillance Shoreline Protection and Deflection Shoreline Clean-up Oiled Wildlife Response

Table 7-11: Priority planning areas for vessel collision event spill scenario

Potential area of impact	Distance from source of spill	Shoreline values	Planned response tactics
Dot Shoreline Cell # 318 (Montebello Islands)	30 km	Turtles – BIAs including nesting Seabirds – BIAs including breeding Mangroves Coral and reef communities Australian Marine Park	Monitor, Evaluation and Surveillance Shoreline Clean-up Oiled Wildlife Response

7.3.2 Activity-specific response option selection

To select the appropriate response options for this EP, hydrocarbons applicable to the worst credible scenarios specific to this activity are:

- Group 1 – Wheatstone trunkline fluids
- Group 2 – MDO.

The outcomes of the Strategic NEBA are outlined in Table 6-1 of the OPEP (Ref. 2). Taking into account the priority planning areas identified in Table 7-10 and Table 7-11, the outcomes of the Strategic NEBA determined that the recommended response options proposed to be used for the spill scenarios associated with this EP include:

- Monitoring, Evaluation, and Surveillance (MES)

- Shoreline Protection and Deflection (SPD)
- Shoreline Clean-up (SHC).

These response options are carried out alongside Oiled Wildlife and Waste Management response tactics. CAPL does not consider Oiled Wildlife and Waste Management as separate response options as they are implemented as support tactics for all spill events in a manner that is commensurate to the level of impact and risk of that event.

7.3.3 CAPL existing spill response capability assessment

Based on the spill response arrangements that CAPL has in place across the business, the capability of these arrangements was determined. This process involved:

- identifying CAPL's existing response arrangements and the equipment and personnel available to CAPL under these arrangements
- defining the response package for each response option, and identifying the critical components for each response package (i.e. equipment or personnel that are limited in number and cannot be purchased or accessed readily)
- determining the number of critical components available to CAPL under existing arrangements
- Identify the number of response packages available to CAPL under existing arrangements
- defining the volume of hydrocarbons that could be recovered or treated per response package.

The outcome of this evaluation is included as Appendix C of the OPEP (Ref. 2).

7.3.3.1 CAPL project-specific capability requirement assessment

To understand the spill response capability required for this activity, CAPL assessed the worst-case credible spill event and used modelling to understand the number of packages per response technique that may be required to respond to that event. The steps involved in this assessment were:

1. Review the Strategic NEBA (Ref. 159) and priority planning areas to understand the planned response to an event.
2. Predict the average surface hydrocarbon volume per day; and average volume of hydrocarbon accumulated onshore per shoreline per day (if relevant) to calculate the number of response packages required per response strategy.
3. Review the number of response packages available to determine if the capability exists.

7.3.3.2 CAPL planned response major defect

In accordance with the Strategic NEBA (Ref. 159), the response strategies proposed to be used for this spill scenario and response package calculations are described below. Offshore CAR would not be effective because of the hydrocarbon properties (Group 1).

Implement MES response

A MES response will commence for a subsea release as soon as the spill is identified. This may range from very simplistic visual observation only, through to more involved monitoring and evaluating tactics. Appendix C of the OPEP (Ref. 2) has documented the arrangements that CAPL have in place to implement all the required MES tactics; therefore, this technique is not discussed further.

Implement an SPD response

Deterministic analysis for the largest volume of oil ashore indicates that 225.7 m^3 may wash ashore between day 1 and day 2 after release. The volume of oil ashore was used to support the planned response requirements—the volume of hydrocarbons that would need to be treated by an SPD response is directly correlated to the volume of oil that may wash ashore.

Based on Appendix C of the OPEP (Ref. 2), each protection team is expected to recover 15.6 m^3 of hydrocarbon per day. On the assumption that 225.7 m^3 washes ashore on the second day, CAPL would need up to 8 SPD packages available per day to implement the SPD response. Confirmation that CAPL has the arrangements in place to implement the required number of packages is provided in Table 7-12.

Despite confirmation of capability arrangements in place, it is unlikely an effective SPD response for all islands within these Priority Planning areas would be feasible given the time to shoreline contact. For example, modelling suggests that Ashburton Island would be impacted within one hour from release. It is plausible that shoreline contact on this island may occur before the Wheatstone EMT has been stood up. Rather, areas / islands that are further away from the release site (for example Serrurier and Thevenard Island) would be prioritised for a SPD response given there may be sufficient time to mobilise resources before shoreline contact occurs.

Implement an SHC response

For a spill event such as this (a non-continuous release), deterministic analysis indicates shoreline accumulation (if it occurs) occurs rapidly. CAPL will implement strategies to protect prioritised values and sensitivities; however, the focus would be on SHC operations.

Deterministic analysis for the largest volume of oil ashore indicates that 225.7 m^3 may wash ashore within ~2 days after release; and the maximum length of actionable shoreline oil was predicted to be ~3 km within ~1.875 days.

Based on Appendix C of the OPEP (Ref. 2), each SHC team is expected to recover 1.6 m^3 of hydrocarbon per day. If ten clean-up teams are mobilised on day 2 and used each day, all hydrocarbons can be recovered within 15 days. If required, these efforts could be ramped up as directed and informed by MES activities.

Table 7-12: Major defect response package deployment timeline

Response Technique	Days Following Event							Weeks Following Event				
	1	2	3	4	5	6	7	2	3	4	5	6
No. packages – planned MES	1	1	1	1	1	1	1	1	1	0	0	0
Does CAPL have the required capability?	Y	Y	Y	Y	Y	Y	Y	Y	Y			

Response Technique	Days Following Event							Weeks Following Event				
	1	2	3	4	5	6	7	2	3	4	5	6
No. packages – planned SPD	8	8	0	0	0	0	0	0	0	0	0	0
Does CAPL have the required capability?	Y	Y										
No. packages – planned SHC	0	10	10	10	10	10	10	10	10	0	0	0
Does CAPL have the required capability?		Y	Y	Y	Y	Y	Y	Y	Y			

7.3.3.3 CAPL planned response vessel collision

In accordance with the Strategic NEBA (Ref. 159), the response strategies proposed to be used for this spill scenario and response package calculations are described below. Offshore CAR would not be effective because of the hydrocarbon properties (Group 2).

Implement MES response

A MES response will commence for a subsea release as soon as the spill is identified. This may range from very simplistic visual observation only, through to more involved monitoring and evaluating tactics. Appendix C of the OPEP (Ref. 2) has documented the arrangements that CAPL have in place to implement all the required MES tactics; therefore, this technique is not discussed further.

Implement SPD response

Deterministic analysis for the largest volume of oil ashore indicates that ~24.4 m^3 may wash ashore within ~3 days after release. The volume of oil ashore was used to support the planned response requirements—the volume of hydrocarbons that would need to be treated by an SPD response is directly correlated to the volume of oil that may wash ashore.

Based on Appendix C of the OPEP (Ref. 2), each protection team is expected to recover 15.6 m^3 of hydrocarbon per day. On the assumption that 24.4 m^3 washes ashore on the third day, CAPL would need up to two SPD packages available on day two to implement the SPD response. Confirmation that CAPL has the arrangements in place to implement the required number of packages is provided in Table 7-13.

Implement SHC response

For a spill event such as this (a non-continuous release), deterministic analysis indicates shoreline accumulation (if it occurs) occurs rapidly. CAPL will implement strategies to protect prioritised values and sensitivities; however, the focus may be on SHC operations if time restricts the ability to conduct SPD activities.

Deterministic analysis for the largest volume of oil ashore indicates that 24.4 m^3 may wash ashore within ~3 days after release; and the maximum length of actionable shoreline oil was predicted to be ~10 km within ~4 days This scenario predicted exposure to the western coastlines of Montebello Island.

The Montebello Islands consists of a series of relatively flat limestone islands and sandy beaches and lagoons, easily accessed by boat (dependent on weather and sea conditions). On this basis, response planning indicates it would be feasible to conduct SHC activities.

Based on Appendix C of the OPEP (Ref. 2), each SHC team is expected to recover 1.6 m^3 of hydrocarbon per day. If 5 clean-up teams are mobilised on day 3 and used each day, all hydrocarbons can be recovered 5 days from the start of the spill (3 days of SHC response). If required, these efforts could be ramped up as directed and informed by MES activities.

Table 7-13: Vessel collision response package deployment timeline

Response technique	Days following event							Weeks following event				
	1	2	3	4	5	6	7	2	3	4	5	6
No. packages – planned MES	1	1	1	1	1	1	1	1	0	0	0	0
Does CAPL have the required capability?	Y	Y	Y	Y	Y	Y	Y	Y				
No. packages – planned SPD	0	2	2	0	0	0	0	0	0	0	0	0
Does CAPL have the required capability?		Y	Y									
No. packages – planned SHC	0	0	5	5	5	0	0	0	0	0	0	0
Does CAPL have the required capability?			Y	Y	Y							

7.3.4 Spill response environmental risk assessment

7.3.4.1 Ground disturbance—shoreline spill response

Conducting SPD or SHC involves moving personnel and equipment, which triggers the environmental aspect of ground disturbance.

SPD aims to decrease the overall effect of oil on shorelines before they are impacted and uses booms and sorbents placed adjacent to sensitive shoreline habitats to deflect or capture surface oil.

The objective of SHC is to apply techniques that are appropriate to the shoreline type to remove as much oil as possible. Various techniques may be used alone or in combination to clean oiled shorelines, including shoreline assessment, natural recovery, sorbents, sediment reworking, manual and mechanical removal, and washing, flooding, and flushing.

Source			
In the event of a worst-case spill event (major defect event releasing Wheatstone trunkline condensate, or vessel collision event releasing MDO), implementing SPD and SHC techniques involves people and equipment, which may disturb shoreline habitat.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	Conducting SPD and SHC, including moving personnel and equipment, has the potential to damage terrestrial habitats (including nests), with	5

		subsequent impacts to fauna such as turtles and birds.	
Consequence evaluation			
Potential impacts of SPD and SHC vary, depending on the method used and the shoreline habitat. General impacts include physical disturbance from using personnel, vehicles, and equipment. Particular values and sensitivities in the area that may be affected by the spill include sensitive shoreline habitats (such as mangroves) and nesting / foraging habitat for fauna species such as turtles and birds. The impacts associated with undertaking SHC may be more than if the hydrocarbon product was left in place and remediated through natural processes. Leaving the product in place is a common response option if continual human and vessel/vehicle traffic has the potential to generate greater impacts than the product itself. This technique has been implemented internationally, including for the Montara spill (where persistent components of the product were left to naturally break down in dense coastal mangroves) and the Macondo spill (where marshes and wetlands that had been impacted by weathered product were allowed to recover naturally). If a smaller extent of shoreline is impacted, the impacts from an SHC response activity may be lessened and more localised. Potential impacts associated with using vehicles, personnel, and equipment during SHC (and/or SPD) can include disturbing wildlife feeding or breeding (including damage to nests) and damaging dune structures, vegetation, or intertidal habitats. These shoreline activities have the potential to result in short-term and localised damage to or alteration of habitats and ecological communities and therefore the consequence is ranked as Minor (5).			
ALARP decision context justification			
The risks associated with shoreline oil spill response techniques are well understood, with the techniques having been applied successfully for a number of large spill events. Although there is a good understanding of these response techniques, there is uncertainty regarding the specific location at which this may be undertaken, and the level of response that may be required in these areas. Spill modelling was used to inform the extent of such a spill, and thus provide a sound basis for response planning (including shoreline response) to such an incident. Control measures to manage the risks associated with shoreline spill response techniques are well defined with most being linked to detailed monitoring plans that feed into tactical planning requirements and NEBAs. During stakeholder consultation, no objections or claims were raised regarding spill response activities. The risks arising from implementing shoreline response techniques in the event of a spill are extremely low, and CAPL consider these to be lower-order risks in accordance with Table 5-3. As such, CAPL considers ALARP Decision Context A should be applied for this aspect.			
Good practice control measures and source			
Control measure	**Source**		
OSMP	The OSMP details the arrangements and capability in place for operational and scientific monitoring. Operational monitoring collects information about the oil spill to aid planning and decision making for executing spill response or clean-up operations. Scientific monitoring focuses on the environmental impact attributable to the spill or the associated response activities and informs requirements for remediation (if required). CAPL has developed an NOPSEMA-accepted OSMP (Ref. 3) to support all spill monitoring activities across all its assets. Specifically, Operational Study 6 – Rapid Seabird and Shorebird Assessment and Operational Study 7 – Rapid Marine Megafauna Assessment provide information on the presence of wildlife with regards to predicted trajectory to understand the level of oiled wildlife response (OWR) required.		
Likelihood and risk level summary			
Likelihood	Depending on the clean-up technique and habitat, potential consequences of shoreline cleaning are remote (Note: Mechanical methods are generally		

	expected to have greater consequences than manual cleaning). With the control measures in place, CAPL assessed the likelihood of the consequence described above as Remote (5).	
Risk level	Very low (9)	
Acceptability summary		
Principles of ESD	The potential impact associated with this aspect is considered to have the potential to result in minor, localised, incidental damage to, or alteration of, habitats and ecological communities; however, this is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation and other requirements relevant to this aspect were identified.	
Internal context	This CAPL environmental performance standard / procedure was considered relevant for this aspect: • OSMP (Ref. 3).	
External context	During stakeholder consultation, no objections or claims were raised regarding spill response activities.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the environment during event response	**OSMP** In the event of a spill occurring, the OSMP will be implemented	Records confirm the OSMP has been implemented

7.3.4.2 Physical presence—oiled wildlife response

Oiled wildlife response (OWR) activities are aimed at treating fauna that have encountered, or are likely to encounter, spilt hydrocarbons. OWR generates the environmental aspect of physical presence/interaction with fauna, through handling, treating, rehabilitating, and releasing fauna.

Source			
In the event of a worst-case spill event (major defect event releasing Wheatstone trunkline condensate, or vessel collision event releasing MDO), the handling and treating marine fauna (through an OWR) will result in personnel interacting with marine fauna.			
Potential impacts and risks			
Impacts	**C**	**Risks**	**C**
N/A	-	Conducting OWR has the potential to cause further harm to oiled fauna due to hazing, barriers, deterrents, and cleaning activities, and has the potential to cause injury/death.	5

Consequence evaluation	
Particular environmental values that may be affected by OWR activities include marine fauna such as turtles and birds. Due to the intensive nature of OWR activities and the fragile nature of many shore and wading birds, OWR activities can have high bird mortality rates. Physical exclusion and hazing operations can result in entanglement and stress-related impacts to marine birds. Cleaning of oiled wildlife may result in skin irritations, impacts to the hydrophobic properties of bird plumage, and stress-induced physiological effects. Spill modelling indicates that areas along the coast frequented by fauna, such as the Montebello Islands, are areas where OWR is most likely to be undertaken. If a spill coincided with turtle nesting/hatchling or bird nesting periods, a large number of animals may be treated using OWR. Impacts from hazing and deterrents are anticipated to be localised to the area of potential spill impact and limited to the spill period. Even if OWR was undertaken during nesting periods, only a small proportion of the nesting population would be involved as the species potentially involved nest widely elsewhere. The potential consequences associated with an OWR are localised and short term and are ranked as Minor (5).	
ALARP decision context justification	
The risks associated with OWR are well understood, with the technique having been applied successfully for a number of large spill events. Although there is a good understanding of the response technique, there is uncertainty regarding the specific location at which this may be undertaken, the number of animals that may be impacted, and thus the level of response that may be required. Spill modelling was used to inform the extent of such a spill, and thus provide a sound basis for response planning to such an incident. Control measures to manage the risks associated with OWR are well defined with most being linked to detailed monitoring plans that feed into tactical planning requirements and NEBAs. During stakeholder consultation, no objections or claims were raised regarding OWR activities. The risks arising from implementing OWR in the event of a spill are extremely low, and CAPL consider these to be lower-order risks in accordance with Table 5-3. As such, CAPL considers ALARP Decision Context A should be applied for this aspect.	
Good practice control measures and source	
Control measure	**Source**
OSMP	The OSMP details the arrangements and capability in place for operational and scientific monitoring. Operational monitoring collects information about the oil spill to aid planning and decision making for executing spill response or clean-up operations. Scientific monitoring focuses on the environmental impact attributable to the spill or the associated response activities and informs requirements for remediation (if required). CAPL has developed an NOPSEMA-accepted OSMP (Ref. 3) to support all spill monitoring activities across all its assets. Specifically, Operational Study 6 – Rapid Seabird and Shorebird Assessment and Operational Study 7 – Rapid Marine Megafauna Assessment provide information on the presence of wildlife with regards to predicted trajectory to understand the level of OWR required.
Likelihood and risk level summary	
Likelihood	Where there is the possibility for surface oil to impact wildlife, the risks associated with OWR are lower than those associated with inaction. With the control measures in place, the likelihood of the described consequences occurring from OWR activities was determined to be Remote (5).
Risk level	Very low (9)

Acceptability summary		
Principles of ESD	The potential impact associated with this aspect is considered as having the potential to result in a localised incidental impact and thus is not expected to affect biological diversity and ecological integrity. The consequence associated with this aspect is Minor (5). Therefore, no additional evaluation against the Principles of ESD is required.	
Relevant environmental legislation and other requirements	No legislation and other requirements considered relevant to this aspect were identified.	
Internal context	The CAPL environmental performance standard / procedure considered relevant for this aspect is: • OSMP (Ref. 3).	
External context	During stakeholder consultation, no objections or claims were raised regarding spill response activities.	
Defined acceptable level	These impacts and risks are inherently acceptable as they are considered lower-order impacts in accordance with Table 5-3. **In addition, the potential impacts and risks evaluated for this aspect are not inconsistent with any relevant recovery or conservation management plan, conservation advice, or bioregional plan.**	
Environmental performance outcome	**Performance standard / Control measure**	**Measurement criteria**
Reduce the risk of impacts to the environment during event response	**OSMP** In the event of a spill occurring, the OSMP will be implemented	Records confirm the OSMP has been implemented

8 Implementation strategy

This implementation strategy identifies the systems, practices, and procedures used to ensure the environmental impacts and risks of the petroleum activities are continuously reduced to ALARP and the environmental performance outcomes and standards detailed in Sections 6 and 7 are achieved.

8.1 Operational Excellence Management System

CAPL's operations are managed in accordance with Chevron Corporation's OEMS, which is a comprehensive management framework that supports the corporate commitment to protect the safety and health of people and the environment. The OEMS aligns with ISO 14001:2015 *Environmental management systems - Requirements with guidance for use* (Ref. 51) and meets the requirements of the OPGGS(E)R.

OE systematically manages workforce safety and health, process safety, reliability, and integrity, environment, efficiency, security, and stakeholders to meet the OE objectives and ensure safe operations of CAPL facilities and projects. The OEMS comprises the following key components (Figure 8-1):

- **leadership and OE culture**—through the OEMS, CAPL leaders engage employees and contractors to build and sustain the OE culture and deliver OE performance
- **management system cycle** (MSC)—by applying the MSC, CAPL leaders make risk-based and data-driven decisions, prioritise activities, and direct improvements
- **focus areas and OE expectations** (including common expectations)—focus areas are categories of OE risks and include workforce safety and health, process safety reliability and integrity, environment, efficiency, security, and stakeholder engagement; OE expectations guide the design, management, and assurance of the presence and effectiveness of safeguards.

The OEMS outlines the process for identifying, establishing, and maintaining safeguards and to provide assurance that they are in place, functioning as intended, and are in accordance with legal and OE requirements. The risk management process (Figure 8-1) assesses and identifies safeguards, which are the hardware and human actions designed to directly prevent or mitigate an incident or impact associated with the project, personnel, and the environment. The assurance process (Figure 8-1) provides the verification and validation that the safeguards are in place and functioning as intended.

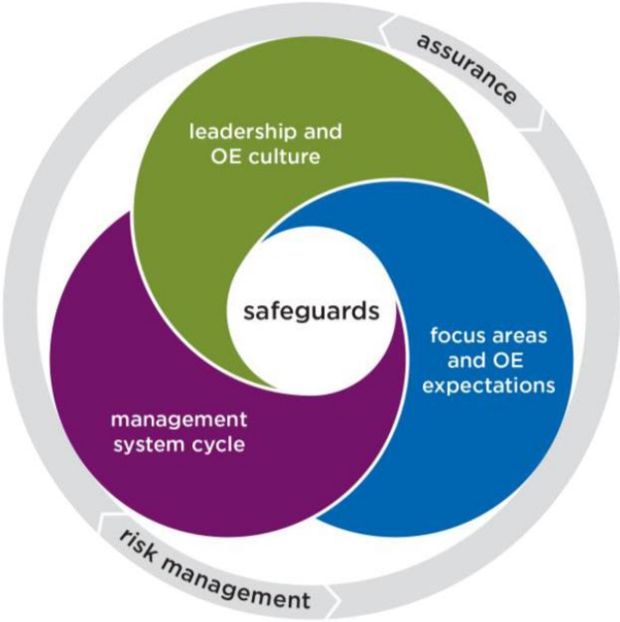


Figure 8-1: Overview of Chevron Corporation's OEMS

8.2 Leadership and OE culture

CAPL leaders demonstrate and are accountable for the consistent and rigorous application of the OEMS to drive performance and manage risks. The actions and visibility of leaders reinforce CAPL's commitment to place the highest priority on the safety and health of its workforce, and on the protection of communities, the environment, and its assets.

8.2.1 Roles and accountability

CAPL leaders have the overall accountability for the implementation of the OEMS.

8.2.1.1 Chain of command (petroleum activity)

A chain of command for implementing the petroleum activity is outlined in Figure 8-2.

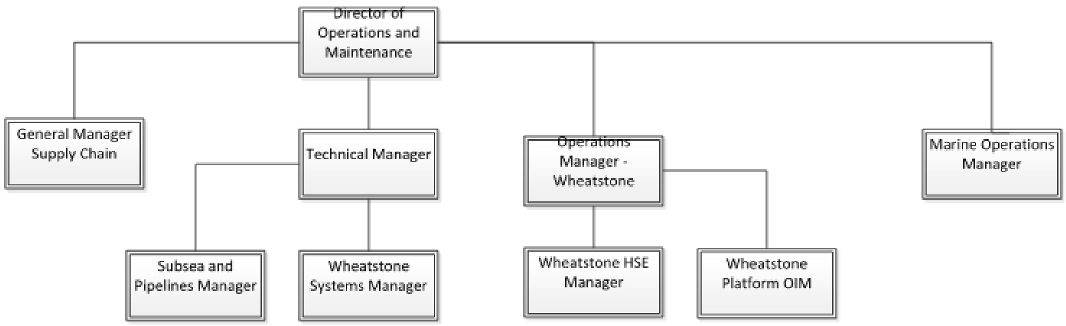


Figure 8-2: Chain of command—petroleum activities

8.2.1.2 Roles and responsibilities (petroleum activity)

The roles and responsibilities of key CAPL and contractor personnel for implementing task-specific control measures are detailed in Sections 6 and 7, and are summarised in Table 8-1.

Table 8-1: Key roles and responsibilities—petroleum activities

<table>
<tr><th>Role</th><th>Responsibilities</th></tr>
<tr><td colspan="2">CAPL personnel</td></tr>
<tr><td>Operations Manager - Wheatstone</td><td>Overall responsibility for implementing, managing, and reviewing this EP</td></tr>
<tr><td>Wheatstone Platform Offshore Installation Manager (OIM)</td><td rowspan="2">Ensure that:
all personnel are made aware of their requirements under this EP
all personnel have the relevant training and competency as described in Section 8.2.1.3
impacts and risks are continually reduced to ALARP by implementing this EP in accordance with Sections 6 and 7
monitoring and reporting is undertaken in accordance with Section 8.4
all changes to this EP are subject to a Management of Change assessment as described in Section 8.3.2.2
compliance with this EP is verified in accordance with Section 8.3.6
this EP is reviewed in accordance with Section 8.5.</td></tr>
<tr><td>Wheatstone HSE Manager</td></tr>
<tr><td>Subsea and Pipelines Manager</td><td>Ensure that inspection and monitoring of the hydrocarbon system is undertaken in accordance with the IM Plan (Ref. 22; Ref. 23)</td></tr>
<tr><td>General Manager Supply Chain</td><td>Ensure that all third-party vessels or contractors are aware of any requirements within this EP</td></tr>
<tr><td colspan="2">Contractor personnel</td></tr>
<tr><td>Vessel Master</td><td>Ensure that:
impacts and risks are continually reduced to ALARP by implementing this EP in accordance with Sections 6 and 7
all incidents are reported to CAPL
all emissions and discharges are monitored and recorded in accordance with Sections 6 and 7.</td></tr>
</table>

8.2.1.3 Training and competency (petroleum activity)

In accordance with Regulation 14(5) of the OPGGS(E)R and Regulation 15(5) of the PP(E)R, each employee responsible for implementing task-specific control measures during operational activities must be aware of their specific responsibilities as detailed in this EP. People who hold responsibilities relating to implementing this EP are hired by CAPL on the basis of their particular qualifications, experience, and competency.

All external contractor personnel involved with activities within scope of this EP will hold qualifications or training certification relevant to their role, which will be confirmed through the contractor selection process, audits and review processes.

Personnel with specific responsibilities under this EP (refer to Section 8.2.1.2) were included during the internal review of this EP and are made aware of their role-specific responsibilities under this EP.

All personnel (including contractors) are required to attend inductions and/or training that are relevant to their role (Table 8-2).

Table 8-2: Training and competency—petroleum activities

Type	Required personnel	Scope
Induction	All relevant personnel	Before commencing operations, all personnel, including subcontractors, must attend an induction that includes an overview of the requirements of this EP. This induction fosters environmental stewardship amongst all personnel and ensures that they are aware of the control measures implemented to minimise the potential impact on the environment. The induction includes: • awareness of Chevron Corporation's Operational Excellence Policy 530 (appendix a) • an overview of environmental sensitivities, and key impacts and risks from the petroleum activity • cetacean interaction requirements under Part 8 of the EPBC Regulations 2000 • fauna interaction requirements under Biodiversity Conservation Regulations 2018 • good waste management and hazardous materials housekeeping requirements • incident reporting requirements • incident response arrangements.
PW laboratory sampling training	All laboratory personnel	Laboratory personnel taking samples and analysing samples will be competent in ABU – 1645 Produced Water Treatment System – Fundamental Review and CAPL Laboratory Manual standards.
MSRE	All vessel personnel	Vessel personnel meet minimum MSRE competency requirements.
Platform operations	All relevant platform personnel	Competency requirements for the following operational roles as described in the Competency Management System (CMS): • Platform crane operators • CRT • Seawater system operators • Drainage system operators • Platform flare system operators • Platform turbine operators • Platform compressor operators

8.3 Focus areas and OE expectations

The OE expectations are organised into six focus areas (Figure 8-3). The OE expectations provide guidance to design, operate, maintain, improve, and assure the presence and effectiveness of safeguards. Common expectations also apply and support the OE expectations and focus areas Figure 8-3.

Figure 8-3: Focus areas and common expectations

The focus areas and common expectations relevant to this EP, and their key processes that demonstrate how CAPL is effective in reducing environmental impacts and risks to ALARP and an acceptable level, are listed in Table 8-3. Each of these focus areas and common expectations are described in further detail in the following subsections.

Table 8-3: Relevant focus areas and common expectations

Focus area or common expectation	Key processes
Focus area	
Workplace safety and health	• *Managing Safe Work (MSW): ABU Standardised OE Process* (Ref. 52) • *Marine Safety Reliability and Efficiency: ABU Standardised OE Process* (Ref. 53) • *ABU Hazardous Materials Management Procedure: ABU Standardised OE Procedure* (Ref. 55)
Process safety, reliability and integrity	• OE Information Management: ABU Standardised OE Process (Ref. 56) • *Management of Change for Facilities and Operations: ABU Standardised OE Process* (Ref. 57) • *ABU Surface Equipment Reliability and Integrity Process (SERIP) Base Business: Standardised OE Process (Ref. 58)*
Environment	• *Environmental Stewardship: ABU Standardised OE Process (Ref. 59)* • *Quarantine Procedure Marine Vessels. ABU Standardised OE Process (Ref. 60)*
Stakeholders	• *Stakeholder Engagement and Issues Management: ABU Standardised OE Process* (Ref. 61)
Common expectation	
Risk management	• *ABU OE Risk Management Process* (Ref. 46)
Assurance	• *OE Assurance Corporate Process* (Ref. 62) • *Managing Instances of Potential Nonconformance* (Ref. 65)
Incident investigation and reporting	• *Incident Investigation and Reporting (II&R) Execution Manual* (Ref. 66)
Emergency management	• *Emergency Management OE Process* (Ref. 67)

Focus area or common expectation	Key processes
	• OPEP (Ref. 2) • *Operational and Scientific Monitoring Plan* (OSMP) (Ref. 3)

8.3.1 Workforce safety and health

8.3.1.1 Managing safe work

The MSW expectation is to assess workplace safety and health hazards and manage the risks associated with the execution and control of work performed by CAPL employees, their delegates, contractors, and subcontractors. The MSW system (Ref. 52) is implemented to ensure safe work practices are made available to the workforce. Standards and procedures relating to MSW relevant to this EP include the permit to work (PTW) system. The PTW system, which includes simultaneous operations (SIMOPS) and hazard analysis, is a way to identify, communicate, mitigate, and control hazards associated with work that have the potential to adversely affect HSE. As the potential consequence associated with each task increases, so does the level of controls and approval that are required.

8.3.1.2 Marine

The Marine Safety Reliability and Efficiency (MSRE) process (Ref. 53) identifies the requirements and activities necessary to deliver safe, reliable, and efficient third-party marine operations. This process describes key roles and responsibilities for managing marine safety and establishes measurement and verification activities designed to promote a process of continual improvement.

The MSRE process applies to all marine vessels, emergency response, and all other (non-bulk petroleum) vessels chartered, owned, or operated by CAPL. The process also applies to vessels contracted by an affiliate or contractor that provide marine support or marine services to CAPL.

Vessels are assured and endorsed for their intended work scope by the MSRE Process Authority (or delegate). Contractors and subcontractors are required to meet all requirements in the Corporate Marine Standard (Ref. 54), including the MSRE Marine Contractor HES (MarCHES) qualification and performance monitoring. Contractors and subcontractors are also required to meet any in-force global MSRE marine notices, which must be complied with until they are revoked or added to the CAPL Marine Standard.

The key elements of the MSRE process that apply to the activities outlined in this EP are:

- vessel inspections—vessels used by CAPL or its affiliates must undergo a vessel audit/inspection process before deployment to ensure that the vessels and the staffing levels meet safety requirements and are fit-for-purpose; inspections also ensure emergency procedures (such as SOPEP/SMPEP) are available and that the required standards are met for navigation equipment, lighting, waste systems, and other marine safety protocols including Marine Order 30 (Prevention of Collisions)
- competency management—vessels used by CAPL must be operated by competent personnel who meet applicable international and local regulations

- cargo handling—cargo transport and handling operations on marine vessels must comply with handling procedures and align to standard marine industry practices
- complicated and/or heavy lifts—all lifting and installing of heavy equipment near offshore infrastructure must meet the detailed requirements
- hose management—operations involving the transfer of bulk liquids using loading hoses must align to standard industry practice and safety of the environment
- vessel communication—vessels must have in place communications procedures for operations close to installations, or other mobile units to ensure that safe positioning and communications are maintained at all times.

Vessels provide an activity-specific operational guideline (ASOG), based on their use and specification, which must be accepted by CAPL.

8.3.1.3 Hazardous materials

CAPL's *Hazardous Materials Management Procedure* (Ref. 55) outlines the process for HSE assessment and approval of hazardous materials. Hazardous materials include those classified as 'hazardous substances or 'dangerous goods'.

The *Hazardous Materials Management Procedure* is designed to:

- assess hazardous materials requested for procurement for their HSE risks
- ensure that appropriate controls are identified for using procured hazardous materials and that these controls are communicated to the requestors of the materials and end users at locations within CAPL's operations
- ensure no product includes CAPL-prohibited ingredients
- ensure substitutes were considered if a product contains CAPL-restricted ingredients.

As part of the hazardous materials selection process, hazardous materials that will be discharged to the environment will undergo a detailed environmental assessment. This environmental assessment is guided by the methodology and classification system used by the Offshore Chemical Notification Scheme (OCNS) and Chemical Hazard Assessment and Risk Management (CHARM). Hazardous materials not listed on OCNS or CHARM, are still subject to the environmental assessment described below.

The environmental assessment includes an evaluation of the potential environmental risks that could be associated with the chemical, and considers the relevant dosage, quantity and frequency of the chemical discharge, the location and nature of the receiving environment, and the assessment criteria described in Table 8-4.

The chemical selection process ensures impacts and risks associated with chemical discharge are reduced to levels that are ALARP and acceptable, while meeting operational performance requirements.

Table 8-4: Chemical risk assessment criteria

Assessment criteria	Selection rationale
Potential for acute and/or chronic toxicity to aquatic life	The toxicity of a chemical is the fundamental consideration within this assessment. This reflects the UK OCNS system which ranks chemicals based on their toxicity, and then adjusts rankings depending on biodegradation and bioaccumulation properties. The scale for toxicity is based on the toxicity rating classification system used by DMIRS, from Hinwood et al. (Ref. 72).
Persistence or biodegradability	Biodegradation rate provides an indication of the potential persistence of the chemical within the environment, and therefore the potential duration of exposure for environmental sensitivities. The scale for biodegradation is based on adjustment criteria used by Centre for Environment, Fisheries and Aquaculture Science (CEFAS) to finalise chemical hazard assessment scores under the OCNS system.
Bioaccumulation or bio-concentration	Indicates the potential for the chemical (or components of the chemical) to accumulate within biological matrices and food chains. Chemicals which may not be toxic and are introduced to the environment in low concentrations can concentrate within biological matrices to the point where they become toxic and may have either acute or chronic effects. The scale for bioaccumulation is based on adjustment criteria used by CEFAS to finalise chemical hazard assessment scores under the OCNS system.

8.3.2 Process safety, reliability and integrity

8.3.2.1 OE information management

Under the OEMS, records (including compliance records to demonstrate environmental performance and compliance with commitments in this EP) will be retained in accordance with Regulation 27 of the OPGGS(E)R and Regulation 31 of the PP(E)R.

The OE information management process (Ref. 56) explains how critical information related to HSE, reliability, efficiency, and process safety is to be identified, developed, assessed, and maintained so that the workforce has access to, and is using, the most current information. This document describes key roles, responsibilities, and competencies associated with the process, and includes measurement and verification activities.

Vessel contractors will maintain records as above and are required to make these available upon request.

8.3.2.2 Management of change

Management of Change (MoC) expectations are to manage proposed changes to design, equipment, operations and products before they are implemented. In conjunction with the *ABU OE Risk Management Process* (Section 8.3.5), the *Management of Change for Facilities and Operations* process (Ref. 57) is followed to document and assess the impact of changes to activities described in this EP. These changes will be addressed to determine if there is potential for any new or increased environmental impact or risk not already provided for in this EP. If these changes do not trigger relevant petroleum regulations, as detailed below, this EP will be revised, and changes recorded in the EP without resubmission.

In accordance with Regulation 17 of the OPGGS(E)R, and Regulation 18 of the PP(E)R, this EP must be resubmitted to NOPSEMA or DMIRS under the relevant jurisdiction in the following circumstances:

- before commencing a new activity, or any significantly modification or new stage of the activity, not provided for in this EP
- if a change in the titleholder results in a change in the manner in which the impacts and risks of the activity are managed
- as soon as practicable after the occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk, that is not provided for in this EP
- as soon as practicable after the occurrence of a series of new environmental impacts or risks, or a series of increases in existing environmental impacts or risks, occur which, taken together, amount to the occurrence of a significant new environmental impact or risk, or a significant increase in an existing environmental impact or risk, not provided for in this EP.

8.3.2.3 Computerised maintenance management system

The computerised maintenance management system (CMMS) supports asset integrity management and reliability management through a rigorous, detailed register of inspection and maintenance tasks and data records, including maintenance planning and scheduling. Each item (down to component level) is assessed, has a criticality assigned based on importance, performance standards (including those based on manufacturers' specifications or similar), and a start date and frequency for inspections and maintenance. Items of high criticality are to be completed on time, or adequately managed under the deviation process.

8.3.2.4 Laboratory information management system

The laboratory information management system (LIMS) provides for the planning, collection, analysis, recording, and reporting of platform samples to ensure product quality, plant reliability, and to support real-time monitoring. Requirements and schedules are developed within the LIMS, and non-compliance alerts are reported internally. Generally, the platform PW laboratory results and other relevant water sampling results are managed through the LIMS.

8.3.2.5 Production information management system

The production information management system (PIMS) accurately records information relating to production, metering, discharges, and hydrocarbon processing on the platform.

8.3.2.6 Competency Management System

All operations personnel have a competency profile allocated to their position that details training and competence requirements to undertake their duties. CAPL uses a competency management system (CMS) to track and manage competencies and required training for the operations workforce to ensure minimum levels are met and that personnel are trained and competent to undertake their duties.

8.3.2.7 Produced water operating manual

As mentioned in the platform PW risk assessment (Section 6.2.5), a documented response procedure is to be implemented if PW TPH concentrations trend off-specification. This topsides response is described in the platform *Produced Water Treatment System Operating Manual* (Ref. 73) and *Produced Water High Oil in Water Content Procedure* (Ref. 74), and operators follow a tiered response that aims to keep the PW TPH results below 30 mg/L as far as practicable.

8.3.2.8 Emergency operating procedures

Emergency operating procedures (EOPs) provide clear instructions on how operations personnel should respond to emergency scenarios. EOPs provide guidelines for safe hazard mitigation in the event of an emergency and include instructions on critical steps required to safely secure a process unit during specific emergency situations. EOPs provide guidance to platform CCR personnel to detect, isolate, and stabilise non-routine events including platform and hydrocarbon system loss of containment events (Ref. 76).

8.3.3 Environment

8.3.3.1 Environmental stewardship

The environmental stewardship process (Ref. 59) is designed to identify, assess, and manage potentially significant environmental impacts in a consistent manner and continually improve environmental performance. The objectives of the process are to:

- provide a consistent approach to environmental stewardship
- reduce the potential for environmental impacts
- support continual improvement in environmental performance throughout the lifecycle of Chevron’s assets.

8.3.3.2 Quarantine

The *Quarantine Procedure Marine Vessels* (Ref. 60) provides information about quarantine compliance to CAPL, contractors, and others associated with marine vessels.

The purpose of this procedure in relation to the offshore title areas is to prevent offshore facilities and activities associated with CAPL title areas becoming staging areas for the introduction of marine pests into Australian waters and ports.

This procedure also outlines the requirements for vessels operating in title areas and details the premobilisation requirements and ongoing management of vessels operating in title areas.

8.3.4 Stakeholders

Stakeholder engagement expectations are to manage social, political, and reputational risks to CAPL (and Chevron), address potential business impacts, and generate business value by:

- identifying, assessing, and prioritising issues
- building and maintaining relationships with external stakeholders, including governments and the communities where CAPL operates

- developing and executing issue management and stakeholder engagement plans, tracking engagements and issues, and validating the effectiveness of plans.

The *Stakeholder Engagement and Issues Management Process* (Ref. 61) details an integrated approach for engaging stakeholders and managing external stakeholder issues. This process describes key roles and responsibilities for stakeholder engagement, establishes measurement and verification activities designed to monitor the effectiveness of the stakeholder engagement process and to promote continual improvement.

Section 2.6 describes the process undertaken for appropriate consultation with relevant authorities and relevant interested persons or organisations. CAPL will continue to engage with relevant stakeholders as described in Section 2.6.5.

8.3.5 Risk management

The risk management process (Ref. 46) assesses and identifies safeguards, which are the hardware and human actions designed to directly prevent or mitigate an incident or event and is designed to be consistent with the environmental risk management requirements of ISO 14001 *Environmental Management System* (Ref. 51) and ISO 31000:2018 *Risk management – Principles and guidelines* (Ref. 47).

This risk management process is summarised in Section 5 of this EP. Additional risk assessments must be undertaken if the MoC process (Section 8.3.2.2) is triggered. Risk assessments are undertaken in accordance with this process.

The *ABU OE Risk Management Process* (Ref. 46) and the *Management of Change for Facilities and Operations* process (Ref. 57) are the key systems CAPL use to ensure, that in accordance with Regulation 14(3)(a) of the OPGGS(E)R and Regulation 15(3)(a) of the PP(E)R, the impacts and risks of the petroleum activity continue to be identified and reduced to ALARP.

8.3.6 Assurance

Within the OEMS, assurance is a common expectation that supports the OE objective of each focus area. The *ABU OE Assurance Process* (Ref. 62) enables CAPL to deliver assurance that safeguards are established and functioning; it details:

- a framework for managing safeguards and verification activities that assure that CAPL complies with applicable legal and OEMS requirements
- a process to identify and resolve potential noncompliance
- the minimum qualifications and organisational capability to execute this process.

The *ABU OE Assurance Plan* (Ref. 63) is a multi-year plan that documents the CAPL ABU integrated assurance system and associated assurance activities (Figure 8-4). The *ABU OE Assurance Plan* is reviewed and approved annually and includes:

- a list of OE assurance priorities based on risk
- a schedule of assurance activities to evaluate safeguards and verifications (e.g., safeguard assurance workshops, audits, and assurance programs)

- reference to asset assurance plans that outline asset specific assurance activities and risk-based frequency (i.e., field inspection programs, audits, compliance reviews, performance reviews).

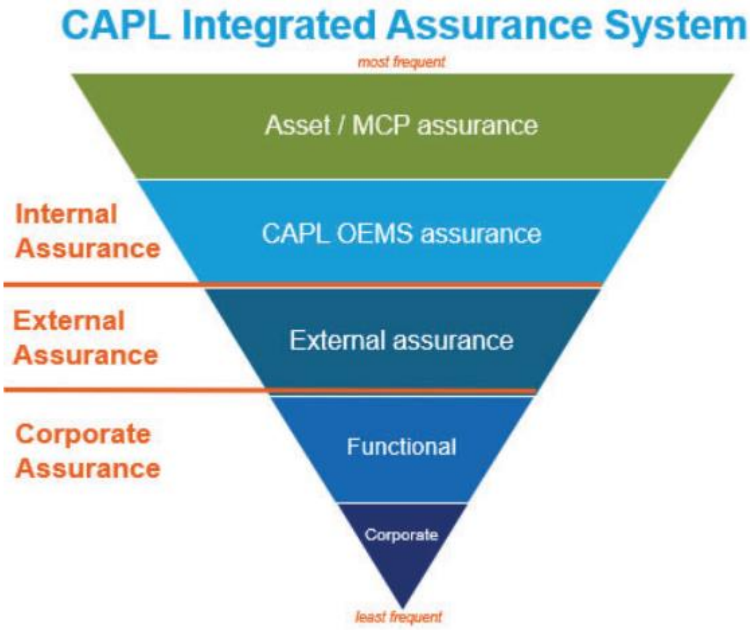


Figure 8-4: ABU integrated assurance system

To support the implementation of the *ABU OE Assurance Process* (Ref. 62), CAPL have developed an ABU integrated assurance system (Figure 8-4), which integrates and leverages assurance activities across the various levels of CAPL business through to the corporate level—to provide confidence that safeguards are in place and functioning as intended. This integrated assurance system includes:

- asset / facility / function assurance: ongoing, routine, planned verifications of safeguards specific for the asset / facility (e.g., HSE inspections, audits, asset integrity inspections, preventive maintenance, emergency drills and exercises, compliance reviews, performance reviews)
- ABU OEMS assurance: implemented through the established system-based assurances within the OEMS and ABU OE processes (e.g., assessments, reviews, audits, inspections, workshops, engagements) that support the CAPL assets and major capital project assurance plans and identify and respond to the systemic deterioration of safeguards and progress areas for improvement
- external assurance: assurance activities undertaken by third-party entities (e.g., regulatory inspections, joint venture partner reviews)
- corporate and functional assurance: assurance activities of CAPL functional groups (e.g., drilling and completions, HSE, FE) and OEMS focus areas to address OEMS requirements, safeguards and areas for improvement.

The *Wheatstone Asset Assurance Schedule* (Ref. 64) documents the specific assurance activities for this EP and is reviewed annually, however it may be updated as required throughout the year based on asset / facility operational risk. Assurance activities are scheduled on a risk-based approach and conducted to verify the effectiveness of safeguards and verifications and the extent to which requirements are met by CAPL.

Assurance activities focus on in-field activities and administrative processes, depending on the activities being undertaken and assurance priorities (these priorities are based on risk) and provide sufficient demonstration that Environmental Performance Objectives and Environmental Performance Standards have been met and the activity implemented in accordance with this Implementation Strategy. A record of all assurance activities undertaken, and the outcomes, are maintained and actions are tracked until closure.

Field inspections are scheduled based on a risk-based assessment and conducted as documented in the asset assurance plan and may range from monthly, quarterly or six monthly depending on the risk assessment.

Field inspections undertaken by the asset / facility are scheduled based on a risk-based assessment and conducted as documented in the *Wheatstone Asset Assurance Schedule* (Ref. 64). These are planned and may range from monthly, quarterly, six monthly or annual depending on the risk assessment and the type of assurance activity. Some inspections may be in response to a specific event such as cyclone or rainfall event. For example, a dangerous goods warehouse inspection may be assured monthly and a vegetation clearing permit audit may be assured quarterly.

Note that hydrocarbon system integrity inspections (as described in Section 3.4) also have a role in verifying environmental performance. The type and frequency of these inspections is documented in the *Wheatstone Upstream Subsea System Inspection and Monitoring Plan* (Ref. 22) and *Wheatstone Upstream Trunkline System Inspection and Monitoring Plan* (Ref. 23).

Environmental Performance Standards in the EP undergo an annual compliance review and evidence is gathered for each Environmental Performance Standard to support the annual environmental report. Assurance related to the Wheatstone Project start-up and operations activities described in this EP will be summarised in the annual report submitted to NOPSEMA (Section 8.4.3).

8.3.6.1 Managing instances of potential non-compliance

The *Managing Instances of Potential Nonconformance* procedure (Ref. 65) applies to instances where the requirements of this EP have not been met. This process is used if audit findings identify that activities in the scope of this EP are not being implemented in accordance with the risk and impact control measures identified in Sections 6 and 7.

Audit findings and corrective actions are recorded and tracked in a CAPL compliance assurance database for timely closure of actions. Audit findings that identify a breach of an environmental performance outcome or environmental performance standard will be reported in accordance with Section 8.4.2.

Any suggested changes to activities or control measures arising from audit findings or instances of potential noncompliance will be subject to a MoC process in accordance with Section 8.3.2.2.

8.3.7 Incident investigation and reporting

Incident investigation and reporting (IIR) expectations are to identify, report, record and investigate incidents, analyse trends, correct deficiencies, and share and adopt relevant lessons learned.

The *Incident Investigation and Reporting (II&R) Execution Manual* (Ref. 66) defines the requirements to report, classify, record, and investigate incidents and near misses, including but not limited to injury, occupational illness, environmental impact, reliability, business disruption, and community concern.

The IIR process includes these requirements:

- training for employees and contractors to recognise and report events
- internal and external notification of events
- investigating incidents at the probable level of consequence, with the rigor of investigation based upon learning opportunity and incident severity
- allocating an incident management sponsor for selected investigations
- sharing alerts, lessons learned, and bulletins
- tracking recommended actions to closure
- analysing event trends.

Events that meet the required criteria are recorded in the CAPL incident management system (IMS). The system holds records of the associated investigation results. The lessons learned from selected investigations are shared to reduce the likelihood of future comparable events.

Specific incident reporting requirements for this EP are detailed in Section 8.4.2.

8.3.8 Emergency management

8.3.8.1 Emergency management arrangements

The emergency management arrangements outline a systematic approach for preventing, planning, responding to, and recovering from emergency events and are intended to provide a standardised corporate management and response structure that details emergency management documentation, Emergency Response Organisation (ERO), facilities and equipment, and training and exercises.

The ERO provides a standardised management and response structure for any emergency. Personnel filling roles within this structure may include full-time professionals, but most will be part-time volunteers drawn from across the workforce.

The system used to organise CAPL's emergency management teams (EMTs) is based on the Incident Command System and provides a standardised approach to the coordination of an emergency response across all hazards, including oil spill response. This program is compatible with the Australasian Inter-service Incident Management System (AIIMS), and the *National Plan for Maritime Environmental Emergencies* (National Plan; Ref. 68) and is consistent with the core aspects presented in the International Maritime Organisation (IMO) equivalent courses.

The ERO comprises the groups listed in Table 8-5; this table also describes the major functions of teams during an emergency.

Figure 8-5 to Figure 8-7 outline the organisational chart of the On-site Response Teams (ORTs) and EMTs. The Crisis Management Teams (CMTs), which focus on the business implications of incidents and events, are further described in the *ABU Crisis Management Plan* (Ref. 69).

As the incident escalates and the workload of each function increases, it may be necessary to delegate specific roles to additional people within each section. These roles may lead a team of people to fulfil the tasks under their control.

To establish emergency response arrangements that can be scaled up or down depending on the nature of the incident by integrating with other local, regional, national, and industry plans and resources, CAPL has adopted a tiered approach in its response system. This tiered-response model scales the number of resources mobilised for a response, and the emergency team activated, according to the severity of the incident. This approach is consistent with the *International Convention on Oil Pollution Preparedness, Response and Cooperation 1990*. The response tiers and resources that may be mobilised for an oil spill incident within CAPL are further described within the OPEP (Ref. 2).

Table 8-5: CAPL emergency management teams

Team	Description
Tier 1 (CAPL)	
On-site Response Teams (ORTs)	Trained responders at the installation who are responsible for on-scene tactical response operations during an incident. ORTs are led by an On-scene Commander (OC) who has incident control during smaller Level 1A incidents, which do not require further escalation to an incident management team. If the IEMT is activated, the OC will come under the direction of the Operations Section Chief (OSC).
Installation Emergency Management Team (IEMT)	The IEMT is led by an Incident Commander (IC) and operates out of an on-site emergency command centre. The IEMT may be activated to take control of Level 1B incidents and coordinate local resources and ORTs.
Perth Emergency Management Team (PEMT)	The PEMT is led by an IC and operates out of a Perth-based emergency command centre. The PEMT may be activated in a support role to assist IEMTs with the emergency response to major incidents that require coordination of further resources, personnel, and support. If required, incident control may also be transferred from the installation to the PEMT to manage the ongoing response (proactive phase) for long-duration, complex incidents such as a major oil spill. The PEMT stands up at the direction of the PEMT IC for Level 2 and 3 incidents.
CAPL Crisis Management Team (CMT)	Comprises senior CAPL executives and ensures emergency response and crisis management operations are carried out consistent with The Chevron Way, Chevron Corporation policies, and the tenets of OE. The CMT stands up at the direction of the CAPL Crisis Manager for Level 3 incidents.
Tier 2 (Regional Response)	
Chevron Corporation's Asia–Pacific Regional Response Team	An enterprise-level team able to support CAPL during the initial response (reactive phase) to a significant incident and help manage the transition to the ongoing response (proactive phase).
Tier 3 (Global Response)	
Chevron Corporation's Functional Response Teams	Enterprise-level teams with specific technical expertise in selected command staff positions and unit positions in the Planning, Logistics, and Finance sections. Team members are trained to support the management of global- and regional-level (Tier 2 and 3) incidents but are available to support any response.

Team	Description
Chevron Corporation's Worldwide Emergency Response Team	An enterprise-level team of Chevron Corporation's most highly trained and experienced personnel capable of filling IMS command and general staff roles of a response organisation, including Deputy IC. Team members are trained to support the management of global-level (Tier 3) incidents but are available to support any response.
Chevron Corporation's Advisory and Resource Team	An enterprise-level initial assessment and support team available to advise during the initial stages of a significant event, assess incident potential, and help the local response team marshal additional resources.

8.3.8.2 Emergency management process

The *Emergency Management OE Process* (Ref. 67) is CAPL's system for emergency management. The process ensures CAPL is prepared to respond immediately and effectively to all emergencies involving contractor- or CAPL-owned or -operated assets as defined in their scope of work.

The emergency management process (Ref. 67) comprises nine key elements.

- emergency scenarios, including worst case, have been identified; these scenarios are based on the findings from risk assessments of significant safety, health and environmental hazards and other sources (e.g., historical incidents)
- emergency response plans are developed and maintained to address emergency scenarios
- a reliability program is in place for inspection, testing and preventative maintenance of critical emergency response equipment and systems supporting emergency response plans
- an incident management system (IMS) is in place capable of immediately and effectively managing all emergencies
- a training and exercise program, including minimum training and exercise requirements, has been developed to establish and maintain emergency response capability
- crisis management plans have been developed to address a potential crisis or significant event
- business continuity plans have been developed in conformance with the Business Continuity Planning Corporate OE Process (Ref. 70).

The OPEP (Ref. 2) acts as an operational document to ensure an appropriate response to the emergency events described in this EP. Smaller spills will be monitored, evaluated, and cleaned up as part of routine duties, where relevant and appropriate to the nature and scale of the spill, and will not require activation of the ORT or OPEP. Several emergency management subprocesses are outlined below that are integral to emergency preparedness and management.

8.3.8.3 Chain of command (emergency response)

A well-delineated EMT chain of command has been established for emergency response (Figure 8-5 to Figure 8-7). As incidents grow in size or complexity, command may transfer several times. Within the response structure, command may transfer between On-scene Commanders (OC) at the tactical level. For a major incident, incident command may transfer to a designated Control Agency or to the Perth EMT, if required.

Although the identity of those filling command positions may change over the course of the incident, the continuity of responsibility and accountability will be maintained. Typically, specialists for particular response options will fulfil Task Leader positions in the ORT where they will be expected to oversee a team or particular response operations.

Throughout an incident, a formal handover will be conducted whenever any command or control position is transferred from one person to another.

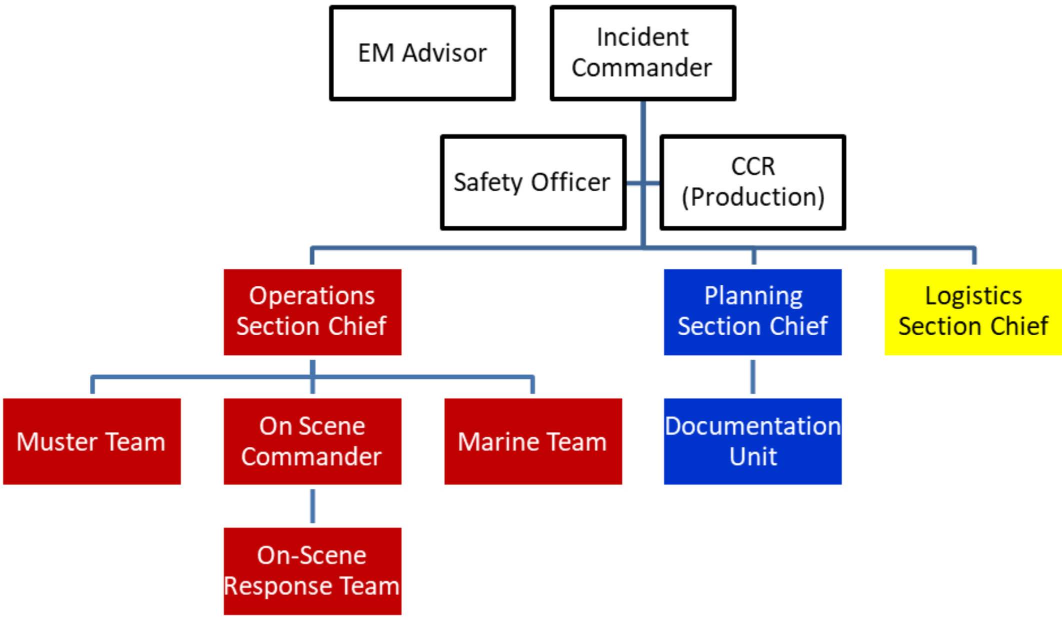


Figure 8-5: Basic installation EMT organisation chart

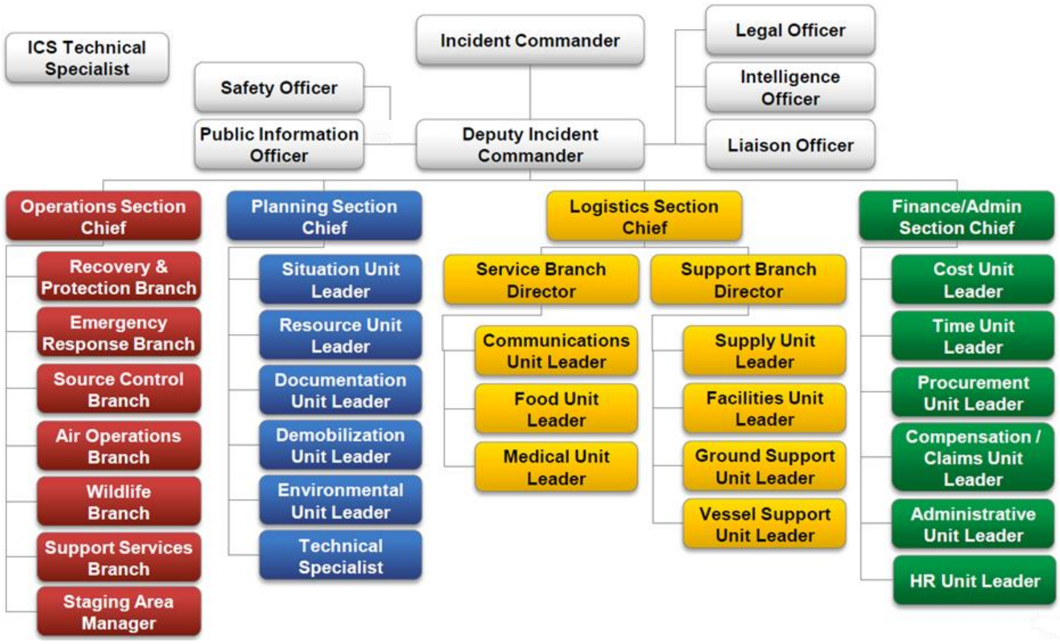


Figure 8-6: Expanded EMT organisation chart

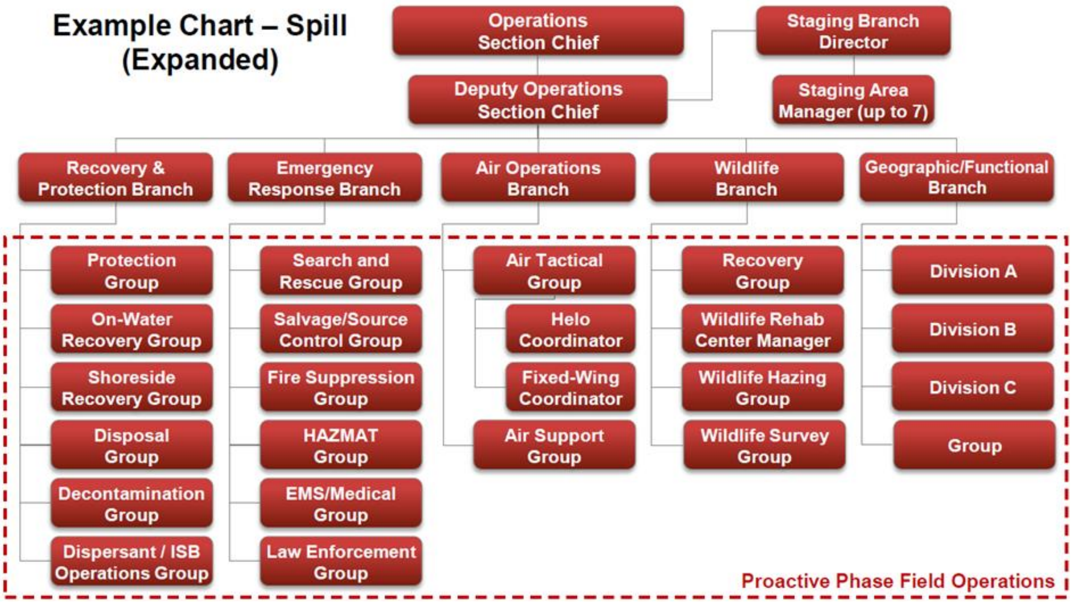


Figure 8-7: Example expanded operations section organisation chart

8.3.8.4 Roles and responsibilities (emergency response)

Table 8-6 provides additional information about the structure of these teams and the key individual roles and responsibilities during emergency response.

Table 8-6: Key roles and responsibilities—emergency response

Role	Responsibilities
On-Site Response Team	
On-Scene Commander (OC)	• Safely and effectively organises and manages the ORT response operations

Role	Responsibilities
(Vessel Master)	• Keeps the EMT informed regarding the nature and status of the incident and on-site tactical response operations
Site Safety Officer	• Ensures that appropriate actions are taken to protect the safety and health of ORT response personnel
Task Leader	• Safely carries out their assignment consistent with directions received from the OC, branch director, division, or group supervisor
Emergency Management Team	
Incident Commander (IC)	• Manages the overall emergency response operations and ensures that they are carried out safely, effectively, and efficiently • Establishes direct line of communications with the OC • Mobilises the EMT and assigns additional support from other response teams (as appropriate to the incident) for Level 2 and 3 incidents that require support beyond the ORT
Operations Section Chief (OSC)	• Provides strategic direction and support to the OC and muster and/or shelter area managers • Receives information regarding the nature and status of the ORT and provides support for mustering and/or shelter-in-place operations • Disseminates information to the IC and other members of the EMT
Planning Section Chief	• Focuses on the incident's potential using the compilation and display of information regarding the nature and status of an incident and emergency response operations • Assists the IC in defining strategic objectives • Assists the IC in providing information to the Level 3 EMT • Compiles and retains documentation
Logistics Section Chief	• Obtains personnel, equipment, materials, and supplies needed to mount and sustain emergency response operations • Provides services necessary to ensure that emergency response operations are carried out safely and efficiently

8.3.8.5 Training and competency (emergency response)

Competencies and training requirements for the EMT, ORT, and other personnel during implementation of the OPEP (Ref. 2) are outlined in Table 8-7. Competency and training records for personnel, including contractors and subcontractors, are maintained.

Table 8-7: Competency and training requirements—emergency response

Role	Summary	Training Standard
Note: Personnel with no specialist emergency response duties should undergo training in line with their responsibilities as indicated below for 'All personnel'.		
All personnel	• Provide basic first response to an incident, including, but not limited to: conducting a quick assessment; making safe; notifying anyone else in danger; and raising the alarm • Complete basic procedures in response to an alarm and evacuate to a muster point (as necessary) • Frequency: every 3 years if not involved in response or drills/exercises	
In addition to the above, personnel responsible for roles with specialist oil spill response duties should undergo further training and practice in line with the responsibilities set out below. Training is provided to maintain the capability to respond to all hazards in line with the Incident Command System implemented by CAPL.		

Role	Summary	Training Standard
Emergency Management Teams (EMTs)		
PEMT Incident Commander	• Selected Perth based personnel, would typically with a manager or senior manager role within CAPL • Competencies: overall management of emergency response operations and ensure operations are performed safely, effectively, and efficiently. Commands the EMT • Frequency: once a year (maintenance of competencies may be through response or training/drills/exercises)	• ICS-100 Introduction to the Incident Command System • ICS-200 Basic Incident Command System training • ICS-220 Initial Response Team • ICS-300 Intermediate Incident Command System Training (PEMT members only) • Oil Spill Awareness Training
PEMT Command and General Staff	• Selected Perth based personnel, typically a manager, or personnel with skills and knowledge appropriate to the function • Competencies: provides strategic direction, internal planning, logistics, and operational support. Operates from the emergency command centre and supports the IC who is responsible for the overall control of the incident • Frequency: once a year (maintenance of competencies may be through response or training/drills/exercises)	• ICS-100 Introduction to the Incident Command System • ICS-200 Basic Incident Command System training • ICS-220 Initial Response Team • ICS-300 Intermediate Incident Command System Training (PEMT members only) • Oil Spill Awareness Training

8.3.8.6 Oil spill exercise schedule

The CAPL *Oil Spill Response Multi-Year Exercise and Drill Schedule* (Ref. 71) describes the schedule of training and exercise required for all emergency events. The training and exercise program incorporates CAPL's oil spill exercise schedule for oil spill training, drills, and exercises. As CAPL'S response arrangements are common among its assets, and resource capabilities are shared, the testing and exercise schedule has been developed to test the various response options. The focus changes for each exercise to ensure any unique aspects of that location (e.g., resources at risk, first-strike equipment) are tested.

The objective is to test and maintain the capability to respond to emergency events. The exercises aim to test:

- notification, activation, and mobilisation of the ORT and EMT
- efficiency and effectiveness of equipment deployment
- efficiency and effectiveness of communication systems.

The testing schedule is a live document that is subject to change. The multi-year exercise schedule (Ref. 71) outlines the proposed testing arrangements to be completed, including the exercise types (Table 8-8) and proposed level of response to be tested (Table 8-9) that may be used to meet the defined objectives. A minimum of one test for each level will be conducted each year.

Table 8-8: Exercise types

Type	Details
Notification exercise	• Tests the procedures to notify and activate the EMTs, support organisations, and regulators
Tabletop exercise	• Normally involves interactive discussions of a simulated scenario amongst members of an EMT; personnel or equipment are not mobilised
Drill	• Conducts field activities such as equipment deployment, shoreline assessment, monitoring etc.
Functional exercise	• Activates at least one EMT to establish command, control, and coordination of a serious emergency event • Often more complex as it simulates several different aspects of an oil spill incident and may involve third parties.

Table 8-9: Exercise levels

Level	Details
Level 1 – ORT	• May be held in conjunction with a Level 2 EMT exercise • Designed to evaluate the ability of ORTs to implement the Gorgon Emergency Management System as it applies to ORTs • ORTs are encouraged to conduct as many exercises as they want each year that do not include the ERT or a Level 2 EMT
Level 2 – EMT	• Exercises may include the participation of an ORT and may be held in conjunction with a Level 3 EMT exercise • Usual duration – one to two hours • Designed to evaluate a Level 2 EMT's ability to notify and activate team members, set up a Level 2 EMT emergency command centre, and implement the Gorgon Emergency Management System as it applies to Level 2 EMTs
Level 3 – EMT	• Each exercise may include the participation of a Level 2 EMT and/or ORT • Usual duration – three to six hours • Designed to evaluate the EMT's ability to notify and activate team members, transfer command to a Level 3 EMT Emergency Command Centre and implement the Gorgon Emergency Management System as it applies to incident escalation

The training and exercise program outlines the process for evaluating training, drills, and exercises against defined objectives, and incorporating lessons learned. An after-action report is generated for all Level 2 (and above) exercises, which is used during spill exercises to assess the effectiveness of the exercise against its objectives and to record recommendations. Relevant actions are then assigned to the responsible party where they are tracked to completion using internal processes. Exercise planners will be required to refer to previous recommendations for continual review and improvement.

Response arrangements as detailed in the OPEP (Ref. 2) must be tested:

- when they are introduced

- when they are significantly amended
- not later than 12 months after the most recent test
- if a new location for the activity is added to this EP after the response arrangements have been tested, and before the next test is conducted: test the response arrangements in relation to the new location as soon as practicable after it is added to this EP.

8.4 Environmental monitoring and reporting

8.4.1 Environmental monitoring

Emissions and discharges to the environment from the petroleum activities will be monitored, as defined in the performance standards and measurement criteria (Sections 6 and 7).

Regulation 14(7) of OPGGS(E)R and Regulation 15(7) of the PP(E)R requires that the implementation strategy provides for sufficient monitoring of, and maintaining a quantitative record of, emissions and discharges such that this record can be used to assess whether the environmental performance outcomes and standards in the EP are being met.

CAPL and vessel contractors will monitor and record emissions and discharges as detailed in Sections 6 and 7 to ensure that that this record can be used to assess whether the environmental performance outcomes and standards in this EP are being met.

If an emergency condition resulting in a Level 2 or 3 spill event occurs, CAPL will implement the OSMP (Ref. 3), which is identified as a control measure in Section 7.1, 7.2, and 7.3.4. The OSMP describes a program of monitoring, and is the principal tool for determining the extent, severity, and persistence of environmental impacts from an emergency condition and the emergency response activities to be undertaken by CAPL.

8.4.1.1 Platform wastewater discharges monitoring framework

The following sections describe the monitoring framework for platform discharges in Commonwealth waters.

Considering the nature and scale of the platform discharges, and the potential risks and impacts (described in Sections 6.2.5 and 6.2.6), the PW discharge is the focus of the Waste Water Discharges Monitoring Framework; however, potential constituents from other discharges are also included, where relevant.

The framework ensures the nature, extent, and potential effect of the PW and other discharges are assessed, and helps determine changes to water quality, sediment quality and benthic habitats in relation to applied environmental quality criteria (EQC).

The framework comprises several monitoring program components (Table 8-10). Figure 8-8 outlines the overall monitoring framework, the relationships between the various elements and the activities that trigger changes.

Table 8-10: Platform wastewater discharges monitoring framework—monitoring programs

Monitoring program	Frequency
Topsides monitoring	• Continuous, daily, weekly, quarterly, annual, (Ref Table 8-11) • Additional monitoring as a result of trigger actions
Field sampling (water quality, sediment & benthic habitats)	• 5 yearly • Additional field sampling as a result of trigger actions or water quality and/or sediment assessments
Model verification	• Model verification as a result of a trigger actions • Validation during operational field sampling campaigns
WET testing (or equivalent)	• Quarterly surrogate test (indicatively 2-species) (minimum annual) • 3 yearly multi (indicatively 8) species test • Additional WET testing as a result of trigger actions, chemical changes or significant PW composition changes

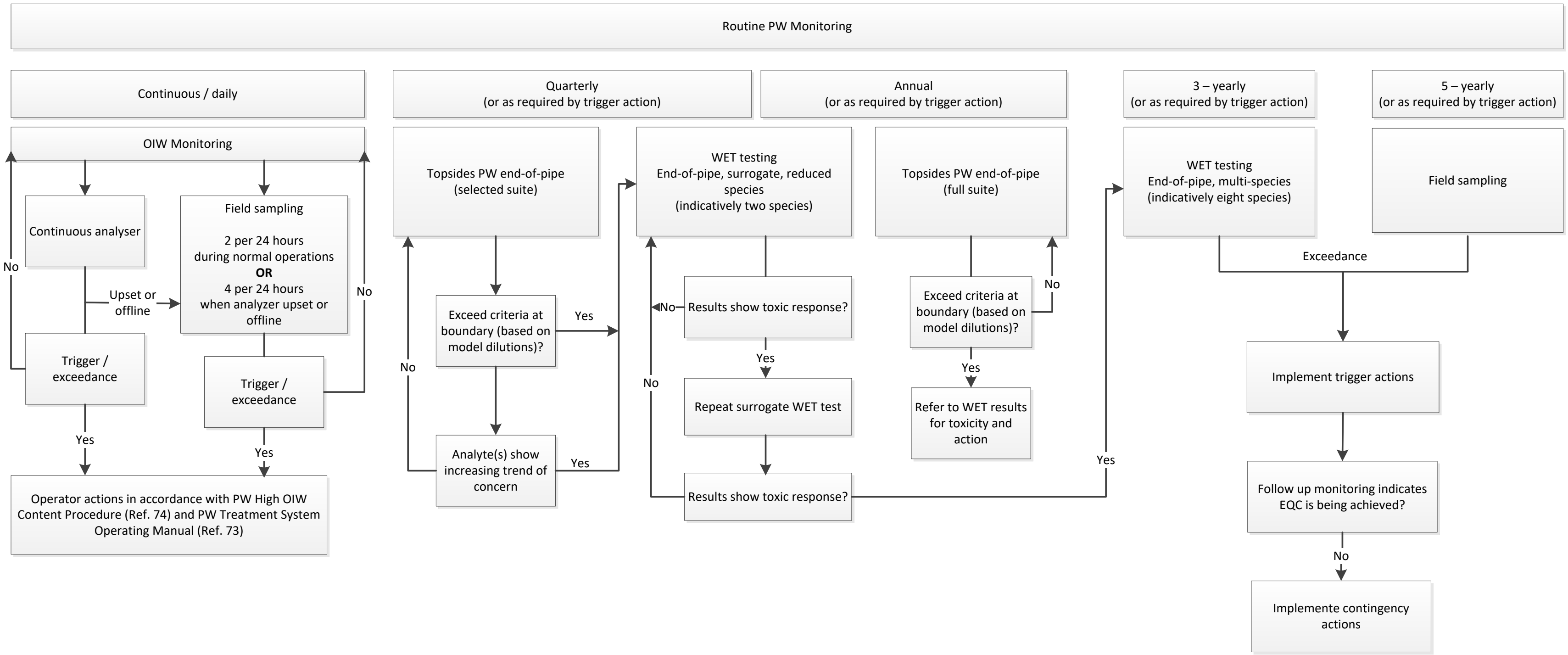


Figure 8-8: Platform wastewater discharges monitoring framework

8.4.1.1.1 Topsides monitoring

The objective of the topsides monitoring program is:

- to use data collected from topsides PW and CW discharges, combined with modelling, to assess whether ANZG Guidelines or equivalent (e.g. developed EGC) are likely to be exceeded beyond the discharge zone boundary and for how long this has or will continue to occur (duration).

The main components of topsides monitoring are listed in Table 8-11.

Table 8-11: Platform wastewater discharges—topsides monitoring

Aspect	Parameters	Frequency
Produced water	Discharge volume (online flow meter)	Normally continuous
	TPH (platform laboratory analysis, typically using a Horiba or similar)	Normally twice every 24 hours, more frequently as required*
	Full Suite Characterisation (samples collected on platform and analysed on Platform or at an onshore laboratory) for selected analytes that may be present in PW: • Metals (total and dissolved); such as Aluminium, Arsenic, Barium, Boron, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Manganese, Mercury (inc Methyl), Molybdenum, Nickel, Strontium, Vanadium, Zinc. • Process Chemical markers (when discharging) – process chemicals and usage may change, however indicatively key components or surrogates of: – Inhibitors; SCW24047UC and BPA68185C – Biocides; BPA68915 – Demulsifers / reverse demulsifers; DMO100, RBW24980 and RBW80243 – pH control; PFR145 (KOH) and CRW24051 – Other; anti-foam DFO24986 and oxygen scavenger OSW24081 • Selected PAH (including naphthalene), MAH (including BTEX), organic acids, glycols (including MEG and TEG), phenols, oxygenated compounds, TPH and NORMS. • Physical and chemical parameters; such as Ammonia, Total Nitrogen, BOD, COD, TOC, TDS, TSS, Bromine, pH, Chlorine, Alkalinity, Conductivity, Major Cations, Major Anions.	Annual
	Selected Suite Selected analytes will be analysed quarterly. Analytes targeted are those regularly present and informative towards PW toxicity. Analytes are subject to reviewed and update as per Section 8.4.1.1.8: • Metals (total); such as Aluminium, Chromium, Cobalt, Iron, Manganese, Mercury, Molybdenum, Nickel, Strontium, Vanadium, Zinc. • TPH. • BTEX; such as Benzene, Toluene, Ethylbenzene, m,p-Xylene, o-Xylene, sum of Xylene, Sum BTEX. • Phenols; such as phenol, cresol isomers (m, o & p- xylene) and 2,4-dimethylbenzene.	Quarterly*

Cooling Water	Hypochlorite concentration	Quarterly
	Temperature	Quarterly
	Discharge volume	Normally continuous
Platform Drainage	TPH (platform laboratory analysis, typically using a Horiba or similar)	Weekly when discharging
Sewage	Calculated volume and percentage of macerated compared to un-macerated sewage discharged to the marine environment	Monthly

** Refer to Section 8.4.1.1.8 for alterations to monitoring of analytes*

8.4.1.1.2 Field sampling

Monitoring of water quality, sediment and benthic habitats was undertaken prior to start-up ('baseline') and will occur every five years. More frequent field sampling may also be implemented as a result of trigger exceedances.

Baseline survey

Sampling of water quality, sediments, and benthic habitats was undertaken prior to commencement of start-up (but after installation and dewatering activities) to establish baseline levels of constituents and conditions for future comparisons during Operations. Although the term baseline has been used for the pre-operational sampling, it should be noted that previous construction activities have already occurred at the site. Therefore the baseline is not reflective of a longer term ecological baseline (prior to any works), but is reflective of a 'before' discharge sampling within a BACI sampling design.

Operational survey

Operational field sampling will be optimised and altered using data collected during baseline sampling as well as collected during operational topsides monitoring. Field sampling programs will be refined and optimised to monitor potential long-term and cumulative impacts as well as providing ground-truthing as to the reliability of the discharge model to predict plume locations.

Data on benthic habitats, water quality and sediment quality will be collected from up to 12 sites located within the predicted discharge zone boundary, and from up to 36 control sites located outside of the predicted discharge zone boundary. Site selection and parameters measured will be tailored for each of the monitoring scopes of water quality, sediments, and benthic habitats.

Water quality

The objectives of the water quality monitoring program include:

- use baseline and reference site data to assess the impact of PW and CW discharges on the receiving environment;
- where topside monitoring indicates EQC are likely to be exceeded beyond the discharge zone boundary and exceedances are likely to continue and are not easily mitigated, field samples will be collected using an appropriately scaled sampling program based on the nature, extent, magnitude and duration of exceedances to verify the spatial extent and severity (magnitude) of the water quality exceedances and verify the accuracy of modelling.

Water quality sampling surrounding the platform will be undertaken following a BACI design (Ref. 29). The BACI design will allow for the detection of potential impacts associated with discharges to the marine environment. Samples will be collected at sites representing control and potentially impacted areas along transects that follow the dominant currents. Control sites will be approximately two to five kilometres away from the platform to ensure the waters are not influenced by the discharge. Sites within the discharge zone boundary will be sampled to allow the extent of any potential impacts to be quantified during operation of the platform.

Sites on the discharge zone boundary will also be sampled to compare with model predictions. The design will include up to 12 replicate sites within the discharge zone and up to 36 sites in the control zone, with replicate samples collected from each site near the surface and bottom of water column. The design will allow for a comparison of potentially impacted areas against unimpacted areas, which are subject to natural variation.

During operations, in situ water quality monitoring will be done in the direction of the prevailing current at increasing distance from the platform, to examine dilution of PW out to, on, and beyond the 850 m boundary. Reference sites for water quality will be collected up-current of the platform, data from which will represent background water quality. Sampling will be done over consecutive days (minimum of 5 days) and on different tidal cycles during the day. During each sampling event the prevailing current direction will be identified by deploying a surface drogue adjacent to the outfall, and information on sampling the co-ordinates, depth, time and date of each sample will be recorded. Data collected over the sampling period (min 5 days) will be interpreted with respect to reference sites and long term percentiles, to minimise the possibility of falsely attributing change to PW discharge, and will additionally be compared with ANZG guidelines (Ref. 11) and any developed EQC, using summary statistics (average, median).

Water samples collected during field surveys will be undertaken in accordance with ANZG guidelines (Ref. 11), but having regard for the logistical and environmental constraints that exist given the isolated nature of the Platform (e.g. constraints on holding times).

Sediment composition

The objectives of the sediment monitoring program include:

- use baseline and reference site data to assess the impact of PW and CW discharges on the receiving environment;
- quantify changes to sediment quality conditions that may be caused by PW and CW discharged from the Wheatstone Platform;
- verify sediment composition where topside monitoring indicates ANZG guidelines (Ref. 11) are likely to be exceeded beyond the discharge zone and exceedances are likely to continue.

Based on reservoir analyses, forecast PW flow rates, and the level of constituents, preliminary calculations predict very low build-up rates, making the risk of sediment contamination low (Ref. 173).

In situ sampling of sediments surrounding the platform will follow a similar BACI design as described for *Water Quality* (above) and will be undertaken 5-yearly (or on trigger). Where topside monitoring indicates ANZG guidelines (Ref. 11) are likely to be exceeded beyond the discharge zone, exceedances are likely to continue and are not easily mitigated, field samples will be collected to verify the spatial extent and severity (magnitude) of exceedances and the accuracy of modelling. These surveys will be appropriately scaled based on the nature, extent, magnitude and duration of exceedances.

More than 90% of the cover of the platform site and its immediate vicinity comprises hard rock with a thin veneer of sand, and a rock blanket is directly below the discharge caisson. Therefore, traditional grab techniques are difficult and unreliable. Sampling methods will be investigated to achieve opportunistic sampling of sediment patches. Survey will include up to 12 replicate sites within the discharge zones and up to 36 sites in the control zone, with replicate samples collected from each site.

Sediment samples collected during field surveys will be undertaken in accordance with ANZG guidelines (Ref. 11), but having regard for the logistical and environmental constraints that exist given the isolated nature of the Platform (e.g. constraints on holding times).

Benthic habitats

The objectives of the benthic habitats monitoring program include:

- to describe the baseline spatial extent and cover (and/or abundance) of sessile benthic invertebrate communities prior to discharge of PW and CW;
- to verify benthic habitat condition where field sampling indicates that ANZG guidelines (Ref. 216) for water and/ or sediment have been exceeded beyond the mixing zone(s) and exceedances are likely to continue;
- to quantify natural changes to sessile benthic habitats through time (every five years) to assist in inferring the cause of changes detected when benthic habitat surveys are triggered in response to an exceedance of water quality guidelines, described in (ii) above or to examine any potential chronic or cumulative impacts from PW and CW.

Benthic habitat surveys occured prior to discharge of PW and CW (baseline); and will occur within the first five years of operations and thereafter every five years. This is based on the modelled predictions that seafloor fauna are likely to be exposed only to very dilute levels of contaminants given the water depth at the platform and that the discharge plume will be positively buoyant. However, in the event that field sampling of water and/ or sediment indicates that ANZG guidelines (Ref. 216) have been exceeded, then benthic habitats will be surveyed using an appropriately scaled sampling program based on the nature, extent, magnitude and duration of exceedances.

Benthic habitats surveys surrounding the platform will follow a similar BACI designed as described for Water Quality (above). Surveys will characterise the spatial extent, distribution, benthic cover and/or abundance and community composition (at a suitable taxonomic resolution to differentiate communities) of benthic habitats. Receptors to be assessed in benthic habitat surveys will include sponges and gorgonians. These taxa were identified as the dominant sessile benthic biota in the ridgeline habitat (Section 4.3.5), they create habitat for other species and are potentially at greatest risk from contaminant exposure due to their sessile (fixed) nature. Photosynthetic taxa, such as algae, seagrasses and hermatypic corals appeared to be largely absent at locations surveyed.

Surveys will use a ROV (or similar), attached high definition video/still camera, and light-emitting diode arrays (or similar) to capture footage of benthic habitats, which can be used to quantitatively assess habitat and biota types. Typically, surveys will use five replicate 50 m transects at each site representing control and potentially impacted areas. Control sites will be approximately two to five kilometres from the platform, outside the predicted impacts of discharges. Predicted impact sites will be near the platform, within the predicted discharge zone boundary. The survey design will include replicate sites within each of the control and impact areas.

Power to detect change above natural variation is predominantly related to the effect size we wish to detect, the natural variability in the parameter to be measured and the level of replication in the sampling design. Therefore, the power of the sampling design cannot be reliably predicted until baseline data has been collected and analysed and the level of natural variability in key taxonomic groups has been assessed. Once this level of variability is known, the design of subsequent surveys can be modified, if necessary, to achieve a desired level of power by changing the level of replication.

Baseline sampling was undertaken to understand the spatial distribution, cover and/or abundance of benthic biota surrounding the Wheatstone Platform. Following this initial survey, natural variability will be examined for key parameters and subsequent surveys during operations can be tailored to achieve a desired level of statistical power (discussed below), which will most likely include a subset of the above baseline survey sites or transects.

For major taxonomic groups of sessile biota (i.e. sponges and gorgonians) the sampling design employed will aim to achieve detection of a 20% change in benthic cover and/or abundance, above natural variation, with a high level of statistical power (power >0.8). A change of 20% in benthic cover and/or abundance was chosen since sessile benthic communities surrounding the platform appear to be relatively sparse (Section 4.3.5) and detection of any smaller change in cover and/or abundance (e.g. 10%) is likely to result in a logistically unfeasible level of replication to achieve a high level of power. However, whilst every effort will be made to achieve a high level of power to detect a 20% change in key taxonomic groups, where certain groups are very low in cover and/or abundance (e.g. <5%) and/or are highly variable in space and time, it may not be possible to achieve such power. In this instance, the design will still aim to detect a 20% change, however, the power to detect such a change may be less than 0.8. Where power to detect changes is less than 0.8, then a gradient approach and or multiple lines of evidence will be used to compliment formal statistical tests, and used in the assessment of possible impacts, such that the ability to describe changes in the environment is not impeded by low power.

Although fish have been identified as potentially at risk from PW and CW discharge, they are not proposed to be monitored as part of the initial and ongoing, routine monitoring programs because they are inherently variable in abundance due to both natural factors (e.g. currents, tidal cycle, time of day), artefacts of sampling method (e.g. avoidance or attraction behaviour towards ROVs and lights) and physical presence of the platform (avoidance or attraction behaviour), making detection of change and inference of the cause of change difficult, even with a large sampling effort.

However, if results of sediment monitoring, water quality monitoring (including quarterly topside monitoring) or WET testing, describe changes that may have deleterious effects on fishes and related species (i.e. crustaceans) beyond the discharge zone boundary, then monitoring of fish will be implemented during operations. The monitoring would focus on demersal fish that may be exposed to chronic/long-term impacts, and not pelagic fish that are generally more transient in nature and thereby less likely to receive chronic exposure to PW and CW. Transient, pelagic fish also pose problems for detecting and inferring change due to high spatial and temporal variability. Due to the limitation of baseline data, monitoring would use an Impact versus Reference, Gradient and/or Lines of

Evidence approach as described in the OSMP, Scientific Guidance Notes (SCI7a – Fish and Aquaculture Impact Study).

8.4.1.1.3 Model verification

Model verification was undertaken in 2018 for PW (Section 6.2.5) and CW (Section 6.2.6). In both cases in-field verification using dye release, drone and an ROV (mounted fluorometer and physical samples) showed modelling to conservatively underpredict actual in-field dilutions. For cooling water, modelling drastically underestimates nearfield mixing because of the presence of entrained air and for produced water modelling underestimates appear to be due to platform-induced turbulence (local flow concentration through the platform and associated turbulence around the base, legs and structural cross-members) which induces additional mixing in the platform lee (Ref. 219). This confirms that end-of-pipe monitoring combined with modelling provides a conservative estimate of the extent of the mixing zones for PW and CW discharges in order to be meet the EPO.

Collection of water quality data during 5-yearly field sampling (as per Table 8-10) will be used to validate that topside monitoring combined with modelling provides a reliable prediction of the extent of the mixing zones for PW and CW discharges. Further model verification may be undertaken as a trigger action should discharge conditions be significantly different from those modelled.

8.4.1.1.4 PW whole effluent toxicity testing

WET testing has been undertaken post start-up on a quarterly basis (>3 years). WET testing employed a combination of monthly proxy testing, 8-species and 3-species tests and has provided a basis for establishing a robust operational WET testing approach (Ref. 257). Surrogate WET tests (indicatively 2-species) will occur quarterly (and not less than annually refer Section 8.4.1.1.8), with multi-species (indicatively 8-species) to occur at least every three years, or as required based on trigger actions and response.

As shown in Figure 8-8, if the results of a surrogate WET test indicate a toxic response at the discharge zone boundary, the surrogate WET test will be repeated within a reasonable time (having regard for logistics and weather). If the repeat test also indicates a toxic response at the discharge zone boundary, a multi species toxicity test (indicatively 8 species) will be implemented at the next monitoring event. A toxic response at the discharge zone boundary from the multi species toxicity test will trigger the trigger / contingency action process. If the initial or repeat surrogate WET test show no toxic response at the discharge zone boundary, routine testing will resume.

At any stage, WET testing may be instigated sooner as a result of trigger actions or if a change in production chemicals introduces new constituents of concern and/ or disclosure from the chemical supplier is insufficient to confirm that the topsides monitoring suite is sufficient to monitor a new production chemical.

WET testing of PW collected from the topsides will be undertaken in accordance with ANZG guidelines (Ref. 11) but having regard for the logistical and environmental constraints that exist given the isolated nature of the Platform (e.g., constraints on holding times). Samples will be collected, stored, and transported according to the relevant parts of AS/NZS 5667.1:1998, and all tests will be conducted by laboratories using National Association of Testing Authorities (NATA) accredited methods where possible.

Outcomes from WET testing will feed into the review process to help define triggers that are appropriate for the sensitivity of local organisms. The tests will enable the discharge criteria to be validated or amended if required, based on actual and relevant toxicity results, as well as provide additional information to assess trigger/contingency plans.

8.4.1.1.5 Review process

Oil in water / TPH monitoring review

As described in Section 6.2.5, TPH is sampled and analysed offshore by the platform laboratory and trended by an analyser. Operations are managed to achieve the performance standard of daily average 30 mg/L TPH during normal operations:

- laboratory samples are assessed to track performance against Performance Standards, and initiate appropriate management response to manage and mitigate as required
- analyser outputs are trended to evaluate process conditions, and help operators manage water quality in accordance with environmental objectives.

Topsides monitoring, WET testing, and field sampling review

As described in Section 6.2.5, the predicted movement and fate of the PW plume and associated constituents around the platform have been modelled and a discharge zone boundary has been determined (850m from the platform), at which constituent concentrations are expected to be at or below defined ANZG trigger levels (Ref. 11). Data from topsides monitoring and field monitoring will be reviewed once data is received, including:

- topside comparison against ANZG and other EQC forecast at the discharge zone boundary (i.e., [discharge value / dilution] < EQC).
- field monitoring comparison against ANZG and other EQC, baseline and modelling.

If concentrations of constituents of concern exceed the EQC triggers at the discharge zone boundary, the risks and impacts will be further quantified and the trigger/ contingency action process implemented (refer Sections 8.4.1.1.6 and 8.4.1.1.7).

Results of surrogate WET tests will be reviewed once data is received. If the results indicate a toxic response, the surrogate WET test will be repeated within a reasonable time (having regard for logistics and weather). If the repeat test also indicates a toxic response, a multi species toxicity test (indicatively eight species) will be implemented at the next monitoring event. A toxic response from the multi species toxicity test will trigger the trigger/ contingency action process. If the initial or the repeat surrogate WET test show no toxic response, routine testing will resume.

Annual summary

On an annual basis, data will be collated and compared to identify longer term trends and improve understanding of platform discharges. Where potential future exceedances of a Performance Standard are identified, trigger actions in addition to those already implemented over the course of the year will be implemented.

8.4.1.1.6 Trigger actions

WET testing and trigger values in the ANZG guidelines (Ref. 11) are concentrations that, if exceeded, could indicate potential adverse environmental impacts, and so 'trigger' a management response, e.g. further investigation and possible topsides actions.

Depending on the nature and scale of the exceedance, a number of trigger actions will be considered by environmental personnel, operators, and laboratory staff. These include action to:

- confirm the exceedance and likely environmental impact, and
- investigate the cause of the exceedance.

The results of the above will determine the necessary corrective actions.

Actions to confirm the exceedance include:

- check analyser readingagainst laboratory samples
- resampling topside discharges
- undertaking modified or additional topside monitoring (e.g. additional numbers of samples, extending the suite of analyses, reviewing sampling points)

To confirm if adverse environmental impacts have occurred, actions to be considered include:

- re-assessing background water quality, sediment composition, and/or habitat surveys to better inform modelled predictions
- extra WET testing to predict impacts of altered PW composition
- extending or adding receptor monitoring programs (e.g. infauna analyses or increasing the frequency or extent of monitoring).

Actions to investigate the cause of the exceedance include:

- assessing conditions that may have changed during that sampling period, which may have influenced the nature and scale of constituent concentrations (e.g. well clean-ups, flow rate changes, chemical changes)
- verify that equipment is being operated and maintained as per basis of design and specification
- operating practices are being followed (such as *PW Treatment System Operating Manual* (Ref. 73) and *PW High OIW Content Procedure* (Ref. 74)), and the controls are effective)
- reviewing chemical usage such as chemical types, dosing specifications versus sample concentrations, and pump calibrations.

Corrective action to address any findings will be taken as soon as practicable. Corrective actions can include:

- amendment to chemicals and/or dosing concentrations (see hazardous materials selection process, summarised in Section 8.3.1.3)
- changes to operational procedures
- maintenance and changes to maintenance schedules
- training.

Follow up monitoring (i.e. resampling) will be undertaken to confirm the effectiveness of implemented changes and that EQCs are being achieved.

If the Trigger Actions listed above still do not correct the trends, concentrations of contaminants of concern or WET testing continues to indicate an exceedance at the discharge boundary, then contingency actions will be triggered (Section 8.4.1.1.7).

8.4.1.1.7 Contingency actions

Contingency actions may include:

- additional tertiary treatment systems (e.g. a third filter bed, more frequent filter change-outs, change in type of filter media, change in treatment system) should TPH in the discharge continue to exceed forecasts and/or design specifications
- diffuser addition or caisson modification to change the dispersion characteristics, should hydrocarbons or metals concentrations exceed expected levels, flow rates change, or properties of the discharge exceed forecast physical characteristics e.g. density or temperature
- addition of removal beds or filtration for mercury or organics should mercury or organics content continue to exceed forecast concentrations
- design modifications to secondary treatment equipment or the process (e.g. use of supplemental packaged equipment, directing more PW through the tertiary treatment system, improved IGF, hydrocyclone technology), should the performance of the topsides water treatment facilities not meet design specifications, and/or improved technology is available.

Implementing any contingency actions will require detailed methodical planning, preparation, and documentation to ensure the effectiveness of the actions and to ensure that risks and impacts are ALARP. Being a new facility with no operating history, the investigation of platform modifications is highly dependent on the nature and scale of the exceedance and the practicality of the proposed modification. Therefore all proposed contingency action design changes will be assessed with respect to the nature and extent of the exceedance, the potential environmental impacts and risks associated with the exceedance, the technical performance of the current systems, the technical performance of additional control measures such as design modifications, and considering the principles of ALARP. The process will typically require input from various subject matter experts, such as operations personnel, process engineers, HSE personnel, and Management.

8.4.1.1.8 Changes to the monitoring framework

Changes to the monitoring framework may be initiated for a number of reasons, these include:

- In line with the *ABU Hazardous Materials Management Procedure: ABU Standardised OE Procedure* (Ref. 55), planned changes to production chemicals (either change of chemical or increased dosing rates) will be assessed and, if required, the topsides analysis suite will be reviewed to confirm (e.g. through consultation with the chemical supplier) that it is sufficient to monitor for the chemical (i.e. considering composition of production chemical).

- The selected topsides analytical suite may be reviewed and the frequency of monitoring specific analytes updated if PW composition changes or specific analytes become more (or less) applicable. The selected suite will be tailored to those analytes that are regularly identified and are providing the most informative data and may include markers or proxy tests such as microtox. The full suite (as shown in Table 8-11) will continue to be analysed at least annually.
- Surrogate WET will be undertaken quarterly to further validate the surrogate testing method as part of the WET testing program. In time, surrogate testing frequency may be reduced based on an evaluation of ecotoxicity data and trends, quarterly topsides analytical results, platform / discharge operational status, and in line with the principles of the adaptive management framework. Surrogate WET will remain at least annual (or on trigger) with multi-species WET at least 3-yearly (or on trigger).
- Chevron will continue to work with subject matter experts (such as CSIRO) to refine the ecotoxicity testing program and advances in testing may be integrated into future methodology.
- The frequency of laboratory samples (i.e. normally twice daily) may be reviewed and amended if at least six months' of data demonstrates the analyser is effective in managing discharge performance to meet water quality objectives. The frequency of laboratory samples will not be reduced to less than weekly.
- Research and development is being undertaken to support continuous improvement in environmental management approaches, including collaboration with university and industry bodies - with new technologies for topsides, analytical and field measurements in development. Should projects currently in early stages of the technology development lifecycle progress to implementation stage, and be shown to pose advantages (i.e. equivalent or better management outcomes) to current monitoring methods, approaches may be amended to reflect these advances. Refer to Section 8.4.1.3 for more information.

8.4.1.2 Platform air emissions monitoring program

Table 8-12 lists the components of the platform air emissions monitoring program.

Table 8-12: Air emissions monitoring program

Monitoring program	Frequency	Description	Review
Greenhouse Emissions (e.g. from flaring, fuel gas and diesel combustion and fugitive emissions)	Ongoing	Recording and reporting of emissions as required by the *National Greenhouse and Energy Reporting Act 2007*	Tracking of compliance against limits established in line with the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*
Criteria Pollutant Emissions (e.g. from flaring, fuel gas and diesel combustion and fugitive emissions)	Ongoing	Recording and reporting of emissions as required by the National Pollutant Inventory.	Annual review of criteria pollutants against NEPM standards.
Flare Monitoring and Optimisation	Ongoing	Continuous monitoring and recording of flaring volumes.	Regular monitoring of performance against flaring performance standard.

State monitoring

Monitoring of emissions and discharges will include those listed in Table 8-13 to provide information for the quarterly report (Table 8-15). The data will be derived from estimations, typically based on the duration of the activity/release/discharge (e.g. using information such as fuel usage) and considering standard industry practices and other available data where relevant. Given the nature and scale of the petroleum activities, and the negligible and intermittent emissions and discharges associated with the activities, monitoring is not continuous, and is conducted on an as-needs basis to ensure data is available for the quarterly discharges report. Generally, equipment is not used to monitor these emissions and discharges.

Table 8-13: Monitoring requirements in State waters and/or onshore

Activity	Aspect	Parameter
IMR vessels in State waters	Planned discharges from vessels performing petroleum activities	Volumes of sewage and oily bilge water
	Air emissions from vessels performing petroleum activities	Volumes of air emissions
Field support activities in PL99 – vehicle usage	Air emissions from vehicles performing petroleum activities in PL99	Volumes of air emissions
IMR activities in PL99 – pigging	Air emissions from the onshore pig receiver	Volumes of air emissions
Field support and IMR activities	Waste generated from IMR activities	Volumes of waste
Field support and IMR activities	Spills in State waters and onshore in PL99	Volumes spilt

8.4.1.3 Alternative measurement approaches

Research and development is being undertaken to support continuous improvement in environmental management approaches, including collaboration with university and industry bodies - with new technologies for topsides, analytical and field measurements in development. Should projects currently in early stages of the technology development lifecycle progress to implementation stage, and be shown to pose advantages (i.e., equivalent or better management outcomes) to current monitoring methods, approaches may be amended to reflect these advances.

Current R&D includes projects which may improve sample gathering, analytical processing or in-field measurements. For example, remote sensing, autonomous vehicles and improved ecotoxicological testing.

Updates to management approaches from advances in technology will be subject to MOC in accordance with Section 8.3.2.2, and involve consultation with NOPSEMA as appropriate.

8.4.2 Incident reporting

Environmental incidents will be reported by CAPL in accordance with Table 8-14.

Table 8-14: Incident reporting

<table>
<tr><th colspan="2">Recordable Incident reporting – Regulation 26B of OPGGS(E)R and Regulation 30 of PP(E)R</th></tr>
<tr><td colspan="2">Legislative definition of ‘recordable incident’:
‘Recordable incident, for an activity, means a breach of an environmental performance objective or environmental performance standard, in the environment plan that applies to the activity, that is not a reportable incident’
Recordable incidents are breaches of the environmental performance outcomes and standards described in Section 5.7.</td></tr>
<tr><th>Reporting requirements</th><th>Report to / Timing</th></tr>
<tr><td rowspan="2">Written notification to NOPSEMA by the 15th of each month
As a minimum, the written incident report must describe:
• the incidents and all material facts and circumstances concerning the incidents
• any actions taken to avoid or mitigate any adverse environmental impacts
• any corrective actions already taken, or that may be taken, to prevent a repeat of similar incidents.
If no recordable incidents occur during the reporting month, a ‘nil report’ will be submitted.</td><td>Submit written report to NOPSEMA by the 15th of each month</td></tr>
<tr><td>Submit written report to DMIRS by the 15th of each month</td></tr>
<tr><th colspan="2">Reportable Incident reporting – Regulations 26, 26A, and 26AA of OPGGS(E)R and Regulations 28, and 29 of PP(E)R</th></tr>
<tr><td colspan="2">Legislative definition of ‘reportable incident’:
‘Reportable incident, for an activity means an incident relating to an activity that has caused, or has the potential to cause an adverse environmental impact; and under the environmental risk assessment process the environmental impact is categorised as moderate or more serious than moderate.’
Therefore, reportable incidents under this EP are those events (not planned activities) that have a moderate or greater consequence (or risk) level. In accordance with this definition, the reportable incidents identified under this EP are:
• introduction of an IMP (Section 6.4.7)
• vessel collision emergency condition (Section 7.1)
• major defect emergency condition (Section 7.2).</td></tr>
<tr><th>Reporting requirements</th><th>Report to</th></tr>
<tr><td rowspan="2">Verbal or written notification must be undertaken within two hours of the incident or as soon as practicable. This information is required:
• the incident and all material facts and circumstances known at the time
• any actions taken to avoid or mitigate any adverse environmental impacts.</td><td>Report verbally to NOPSEMA within two hours or as soon as practicable and provide written record of notification by email.
Phone: (08) 6461 7090
Email: submissions@nopsema.gov.au</td></tr>
<tr><td>Report verbally or in writing to DMIRS within two hours or as soon as practicable.
Phone: (08) 9222 3727
Email: petroleum.environment@dmirs.wa.gov.au</td></tr>
<tr><td>Verbal notifications must be followed by a written report as soon as practicable, and not later than three days following the incident.
At a minimum, the written incident report will include:</td><td>Written report to be provided to:
• NOPSEMA: submissions@nopsema.gov.au
• National Offshore Petroleum Titles Authority: info@nopta.gov.au</td></tr>
</table>

• the incident and all material facts and circumstances • actions taken to avoid or mitigate any adverse environmental impacts • any corrective actions already taken, or that may be taken, to prevent a recurrence. If the initial notification of the reportable incident was verbal, this information must be included in the written report.	• WA DMIRS: petroleum.environment@dmirs.wa.gov.au
Additional Reporting Requirements	
Reporting requirements	**Report to**
An oil/gas pollution incident that occurs within a marine park or is likely to impact on a marine park. 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 (e.g. dispersant, containment, etc.) • confirmation of providing access to relevant monitoring and evaluation reports when available • contact details for the response coordinator.	DNP (24-hour) Marine Compliance Duty Officer Phone: 0419 293 465.
Death or injury to individual(s) from an EPBC Act Listed Species as a result of the petroleum activities	Report injury to or mortality of EPBC Act Listed Threatened or Migratory species within seven business days of observation to DAWE or equivalent: • Phone: +61 2 6274 1111 • Email: EPBC.Permits@environment.gov.au
Vessel collision with marine mammals (whales)	Reported as soon as practicable. https://data.marinemammals.gov.au/report/shipstrike
Presence of any suspected IMP or disease within 24 hours	DPIRD: • Email: biosecurity@fish.wa.gov.au • Phone: FishWatch 24-hour hotline: 1800 815 507

8.4.3 Routine environmental reporting

Regulation 26C of the OPGGS(E)R and Regulation 16 of the PP(E)R requires environmental performance reporting for the activity described in this EP, as summarised in Table 8-15.

Table 8-15: Routine external reporting requirements

Reporting requirement	Description	Reporting to	Timing
Environmental performance	A report detailing environmental performance of the	NOPSEMA submissions@nopsema.gov.au Phone: +61 8 6461 7090	Annually from commencement of activities

Reporting requirement	Description	Reporting to	Timing
reporting (annual)	activity detailed in this EP	DMIRS Petroleum.environment@dmirs.wa.gov.au	Annually from commencement of activities
Emissions and discharge report	An emissions and discharges report will be submitted that summarises estimated emissions and discharges	DMIRS Petroleum.environment@dmirs.wa.gov.au	Quarterly (within 15 days after the end of the reporting period)
Notification of start of activity	CAPL must complete Form FM1405 and submit to NOPSEMA 10 days before activity commencement	NOPSEMA submissions@nopsema.gov.au or: https://securefile.nopsema.gov.au/filedrop/submissions	Once prior to activity commencement
	CAPL must notify WA DMIRS prior to commencement	DMIRS Petroleum.environment@dmirs.wa.gov.au	Once prior to activity commencement
End of EP notification	CAPL must complete Form FM1405 and submit to NOPSEMA within 10 days of activity completion	NOPSEMA submissions@nopsema.gov.au or: https://securefile.nopsema.gov.au/filedrop/submissions	Once following completion of activity

8.5 Environment Plan review

CAPL will submit a proposed revision of this EP to NOPSEMA and/or DMIRS at least 14 days before the end of the five-year period since the EP was last accepted by the relevant regulator. An OPEP revision will be submitted for approval to DMIRS no later than 14 days prior to 2.5 years since the EP was last approved.

An additional review of the EP and/or OPEP will be undertaken following:

- an emergency event
- the identification of additional response strategies to emergency events
- the identification of deficiencies within the EP or OPEP following the review of emergency response exercises or other activities.

Additional revisions and/or resubmission of this EP to NOPSEMA, in accordance with Regulation 17 of the OPGGS(E) or Regulation 18 of the PP(E)R, will be undertaken in accordance with the OEMS, and particularly the MoC process (Section 8.3.2.2).

9 acronyms and abbreviations

Table 9-1 defines the acronyms and abbreviations used in this document.

Table 9-1: Acronyms and abbreviations

Acronym/ Abbreviation	Definition
ABU	Australasian Business Unit
ACN	Australian Company Number
AHO	Australian Hydrographic Office
AIIMS	Australasian Inter-service Incident Management System
AIS	Automated Identification System
ALARP	As low as reasonably practicable
AMP	Australian Marine Park
AMSA	Australian Maritime Safety Authority
ANZG	Australian and New Zealand Governments
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
AS/NZS	Australian Standard/New Zealand Standard
ASOG	Activity-specific operational guideline
ASV	Accommodation support vessel
BACI	Before-After-Control-Impact
BIA	Biologically important areas
BTAC	Buurabalayji Thalanyji Aboriginal Corporation
BTEX	Benzene, toluene, ethyl benzene, and xylene compounds
CAMBA	China–Australia Migratory Bird Agreement
CAPL	Chevron Australia Pty Ltd
CCR	Central Control Room
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CHARM	Chemical Hazard and Risk Management
CMMS	Computerised Maintenance Management System
CMS	Competency Management System
CMT	Crisis Management Team
CO	Carbon monoxide
cP	Centipoise
CP	Cathodic Protection
CRT	Control Room Technician
CW	Cooling Water
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions

Acronym/ Abbreviation	Definition
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DMP	Western Australian Department of Mines and Petroleum (now DMIRS)
DNP	Director of National Parks
DP	Dynamic positioning
DoT	Western Australian Department of Transport
DotE	Commonwealth Department of the Environment (now DAWE)
DP	Dynamic positioning
DPIRD	Western Australian Department of Primary Industries and Regional Development
EEA	Environmental exposure area
EIS/ERMP	Environmental Impact Statement / Environmental Review and Management Programme
EMBA	Environment that may be affected
EMT	Emergency Management Team
EOFL	End of facility life
EOP	Emergency Operating Procedure
EP	Environment Plan
EP Act	Western Australian *Environmental Protection Act 1986*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPO	Environmental Performance Outcome
EPRS	Emergency pipeline repair system
EQC	Environmental quality criteria
ERO	Emergency Response Organisation
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESD	Ecologically sustainable development
FBR	Full bore rupture
FE	Facilities engineering
FEED	Front end engineering and design
FOSA	Field Operating Services Agreement
HFO	Heavy fuel oil
HIRA	Hazard Identification and Risk Assessment
HP	High pressure
HSE	Health, safety, and environment
IAPP	International Air Pollution Prevention
IBRA	Interim Biogeographic Regionalisation for Australia
IC	Incident Commander

Acronym/ Abbreviation	Definition
ICS	Incident Command System
IEE	International Energy Efficiency
IEMT	Installation Emergency Management Team
IFO	Intermediate fuel oil
IGF	Induced Gas Flotation
IIR	Incident investigation and reporting
IM	Inspection and monitoring
IMM	Inspection, monitoring, and maintenance
IMO	International Maritime Organization
IMP	Introduced Marine Pest
IMR	Inspection, maintenance, and repair
IMS	Incident Management System
IP	Intelligent Pigging
ISO	International Organization for Standardization
ITOPF	International Tanker Owners Pollution Federation
JAMBA	Japan–Australia Migratory Bird Agreement
JDP	Julimar Development Project
JRCC	Joint Rescue Coordination Centre
KEF	Key environmentalf
LAT	Lowest Astronomical Tide
LC_{50}	Concentration or dose found to be lethal in 50% of a group of test species
LIMS	Laboratory Information Management System
LNG	Liquefied Natural Gas
LOC	Loss of containment
LP	Low pressure
MARPOL	International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. Also known as MARPOL 73/78.
MARS	Maritime Arrivals Reporting System
MBES	multibeam echo sounders
MDO	Marine diesel oil
MEG	Monoethylene glycol
MES	Monitor, Evaluation, and Surveillance
MGO	Marine gas oil
MODU	Mobile offshore drilling unit
MS	Ministerial Statement
MSRE	Marine safety, reliability, and efficiency
MSW	Manage Safe Work

Acronym/ Abbreviation	Definition
N/A	Not applicable
NATA	National Association of Testing Authorities
NEBA	Net Environmental Benefit Analysis
NEPM	National Environmental Protection Measures
NEPM AAQ	National Environmental Protection Measure for Ambient Air Quality
NMFS	United States National Marine Fisheries Service
NOPSEMA	National Offshore Petroleum Safety and Environmental Management Authority
NO_2	nitrogen dioxide
NWS	North West Shelf
O_3	Ozone
OA	Operational area
OC	On-Scene Commander
OCNS	Offshore Chemical Notification Scheme
OE	Operational Excellence
OEMS	Operational Excellence Management System
OGUK	Oil and Gas UK
OIM	Offshore Installation Manager
OIW	Oil in water
OPEP	Oil Pollution Emergency Plan
ORT	On-site Response Team
OSC	Operations Section Chief
OSMP	Operational and Scientific Monitoring Plan
OSPAR	Oslo and Paris Conventions for the Protection of the Marine Environment of the North-East Atlantic, 'OSPAR Convention'.
OWR	Oiled Wildlife Response
PA	Planning Area
PAH	Polycyclic Aromatic Hydrocarbons
PARLOC	Pipeline and Riser Loss of Containment
PCPT	piezo cone penetration test
PEMT	Perth Emergency Management Team
PFA	Pipeline flange adaptor
PGPA	Policy, Government and Public Affairs
PIMS	Production Information Management System
PLONOR	Poses Little or No Risk (to the Environment)
POB	People on Board
PPP	Protection Prioritisation Process
PTS	Pipeline termination structure

Acronym/ Abbreviation	Definition
PTS	Permanent threshold shift
PTW	Permit to Work
PW	Produced Water
RBI	Risk-based Inspection
RESDV	Riser Emergency Shutdown Valve
RO	Reverse osmosis
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
ROV	Remotely operated vehicle
RWT	Rhodamine WT
SCSSV	Surface control subsurface safety valve
SEEMP	Ship Energy Efficiency Management Plan
SEL	Sound Exposure Levels
SERIP	Surface Equipment Reliability and Integrity Process
SHC	Shoreline clean-up
SIMOPS	Simultaneous operations
SINTEF	Stiftelsen for Industriell og Teknisk Forskning
SO_2	Sulfur dioxide
SO_x	Sulphur oxides
SOPEP	Shipboard Oil Pollution Emergency Plan
SPD	Shoreline protection and deflection
SPL	Sound pressure level
SSIV	Subsea isolation valve
SSS	Side-scan sonar
TAPL	Texaco Australia Pty Ltd
TEC	Threatened ecological communities
TEG	Tri-ethylene glycol
The Project	Wheatstone Liquefied Natural Gas Project
TPH	Total Petroleum Hydrocarbons
TRG	Tactical Response Guides
TTS	Temporary threshold Shift
UT	Ultrasonic Testing
VOC	Volatile organic compounds
WA	Western Australia
WAFIC	Western Australian Fishing Industry Council’s
WET	Whole effluent toxicity
WOMP	Well Operations Management Plan
WQ	Water Quality

Acronym/ Abbreviation	Definition
YACMAC	Yaburara and Coastal Mardudhunera Aboriginal Corporation

10 references

The following documentation is either directly referenced in this document or is a recommended source of background information.

Table 10-1: References

Ref. No.	Description	Document ID
1.	Chevron Australia. 2021. *Description of the Environment – CAPL Planning Area*. Chevron Australia, Perth, Western Australia. [Attached as appendix d to this EP]	ABU-COP-02890
2.	Chevron Australia. 2020. *Chevron ABU: Consolidated Oil Pollution Emergency Plan (OPEP)*. Chevron Australia, Perth, Western Australia. Available from: https://docs.nopsema.gov.au/A748691 [Accepted by NOPSEMA on 23 December 2020]	ABU-COP-02788
3.	Chevron Australia. 2020. *Operational and Scientific Monitoring Plan: Environmental Monitoring in the Event of an Oil Spill to Marine or Coastal Waters*. Chevron Australia, Perth, Western Australia. Available from: https://docs.nopsema.gov.au/A734611 [Accepted by NOPSEMA on 23 December 2020]	ABU130700448
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5.	Chevron. 2013. *Wheatstone Development Drilling and Completion Program Environment Plan*. Chevron Australia, Perth, Western Australia. [Accepted by NOPSEMA on 11 November 2013]	ABU130500319
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Ref. No.	Description	Document ID
12.	NOPSEMA. 2021. *Guideline: Environment plan decision making*. National Offshore Petroleum Safety and Environmental Management Authority, Perth, Western Australia. Available from: https://www.nopsema.gov.au/sites/default/files/documents/2021-06/A524696.pdf [Accessed: June 2021]	N-04750-GL1721
13.	NOPSEMA. 2019. *Bulletin: Clarifying statutory requirements and good practice consultation*. National Offshore Petroleum Safety and Environmental Management Authority, Perth, Western Australia. Available from: https://www.nopsema.gov.au/assets/Bulletins/A696998.pdf [Accessed: February 2021]	
14.	NOPSEMA. 2020. *Guideline: Consultation with Commonwealth agencies with responsibilities in the marine area*. National Offshore Petroleum Safety and Environmental Management Authority, Perth, Western Australia. Available from: https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A705589.pdf [Accessed: February 2021]	N-06800-GL1887
15.	NOPSEMA. 2021. *Information Paper: Considerations for five-year environment plan revisions*. National Offshore Petroleum Safety and Environmental Management Authority, Perth, Western Australia. Available from: https://www.nopsema.gov.au/sites/default/files/documents/2021-03/A590072.pdf [Accessed: February 2021]	N-04750-IP1764
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21.	NOPSEMA. 2020. *Policy: Section 572 Maintenance and removal or property*. National Offshore Petroleum Safety and Environmental Management Authority, Perth, Western Australia. Available from: https://www.nopsema.gov.au/assets/Policies/A720369.5.pdf [Accessed: April 2021]	N-00500-PL1903
22.	Chevron Australia. 2020. *Wheatstone Upstream: Subsea System Inspection and Monitoring Plan*. Chevron Australia, Perth, Western Australia.	WS2-3000-SUB-PLN-CVX-000-00002-000
23.	Chevron Australia. 2020. *Wheatstone Upstream: Trunkline System Inspection and Monitoring Plan*. Chevron Australia, Perth, Western Australia.	WS2-3320-SUB-PLN-CVX-000-00001-000

Ref. No.	Description	Document ID
24.	DISER. 2018. *Offshore Petroleum Decommissioning Guideline*. Department of Industry, Science, Energy and Resources, Canberra, Australian Capital Territory. Available from: https://www.nopta.gov.au/_documents/guidelines/decommissioning-guideline.pdf [Accessed: April 2021]	
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269.	IPCC, 2021: Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press	

appendix a operational excellence—policy 530

policy 530

operational excellence: achieving world-class performance

It is the policy of Chevron Corporation to protect the safety and health of people and the environment, and to conduct our operations reliably and efficiently. The Operational Excellence Management System (OEMS) is the way Chevron systematically manages workforce safety and health, process safety, reliability and integrity, environment, efficiency, security, and stakeholder engagement and issues. OEMS puts into action our Chevron Way value of Protecting People and the Environment, which places the highest priority on the safety and health of our workforce and the protection of communities, the environment and our assets. Compliance with the law is a foundation for the OEMS.

Our OEMS is a risk-based system used to understand and mitigate risks and maintain and assure safeguards. OEMS consists of three parts:

leadership and OE culture

Leadership is the largest single factor for success in OE. Leaders are accountable not only for achieving results, but achieving them in the right way. Leaders must demonstrate consistent and rigorous application of OE to drive performance and meet OE objectives.

focus areas and OE expectations

Chevron manages risks to our employees, contractors, the communities where we operate, the environment and our assets through focus areas and OE expectations that guide the design, management and assurance of safeguards.

management system cycle

Chevron takes a systematic approach to set and align objectives; identify, prioritize and close gaps; strengthen safeguards and improve OE results.

We will assess and take steps to manage OE risks within the following framework of focus areas and OE expectations:

Workforce Safety and Health: We provide a safe and healthy workplace for our employees and contractors. Our highest priorities are to eliminate fatalities and prevent serious injuries and illnesses.

Process Safety, Reliability and Integrity: We manage the integrity of operating systems through design principles and engineering and operating practices to prevent and mitigate process safety incidents. We execute reliability programs so that equipment, components and systems perform their required functions across the full asset lifecycle.

Environment: We protect the environment through responsible design, development, operations and asset retirement.

Efficiency: We use energy and resources efficiently to continually improve and drive value.

Security: We protect personnel, facilities, information, systems, business operations and our reputation. We proactively identify security risks, develop personnel and sustainable programs to mitigate those risks, and continually evaluate the effectiveness of these efforts.

Stakeholders: We engage stakeholders to foster trust, build relationships, and promote two-way dialogue to manage potential impacts and create business opportunities. We work with our stakeholders in a socially responsible and ethical manner, consistent with our respect for human rights, to create a safer, more inclusive business environment. We also work with our partners to responsibly manage Chevron's non-operated joint venture partnerships and third-party aviation and marine activities.

There are specific OE expectations which need to be met under each focus area. Additional expectations apply to all focus areas and address legal, regulatory and OE compliance; risk management; assurance; competency; learning; human performance; technology; product stewardship; contractor OE management; incident investigation and reporting; and emergency management.

Through disciplined application of the OEMS, we integrate OE processes, standards, procedures and behaviours into our daily operations. While leaders are responsible for managing the OEMS and enabling OE performance, every individual in Chevron's workforce is accountable for complying with the principles of 'Do it safely or not at all' and 'There is always time to do it right'.

Line management has the primary responsibility for complying with this policy and applicable legal requirements within their respective functions and authority limits. Line management will communicate this policy to their respective employees and will establish policies, processes, programs and standards consistent with expectations of the OEMS.

Employees are responsible for understanding the risks that they manage and the safeguards that need to be in place to mitigate those risks. Employees are responsible for taking action consistent with all Company policies, and laws applicable to their assigned duties and responsibilities. Accordingly, employees who are unsure of the legal or regulatory implications of their actions are responsible for seeking management or supervisory guidance.

M Hatfield

Mark Hatfield
Managing Director, Australasia Business Unit

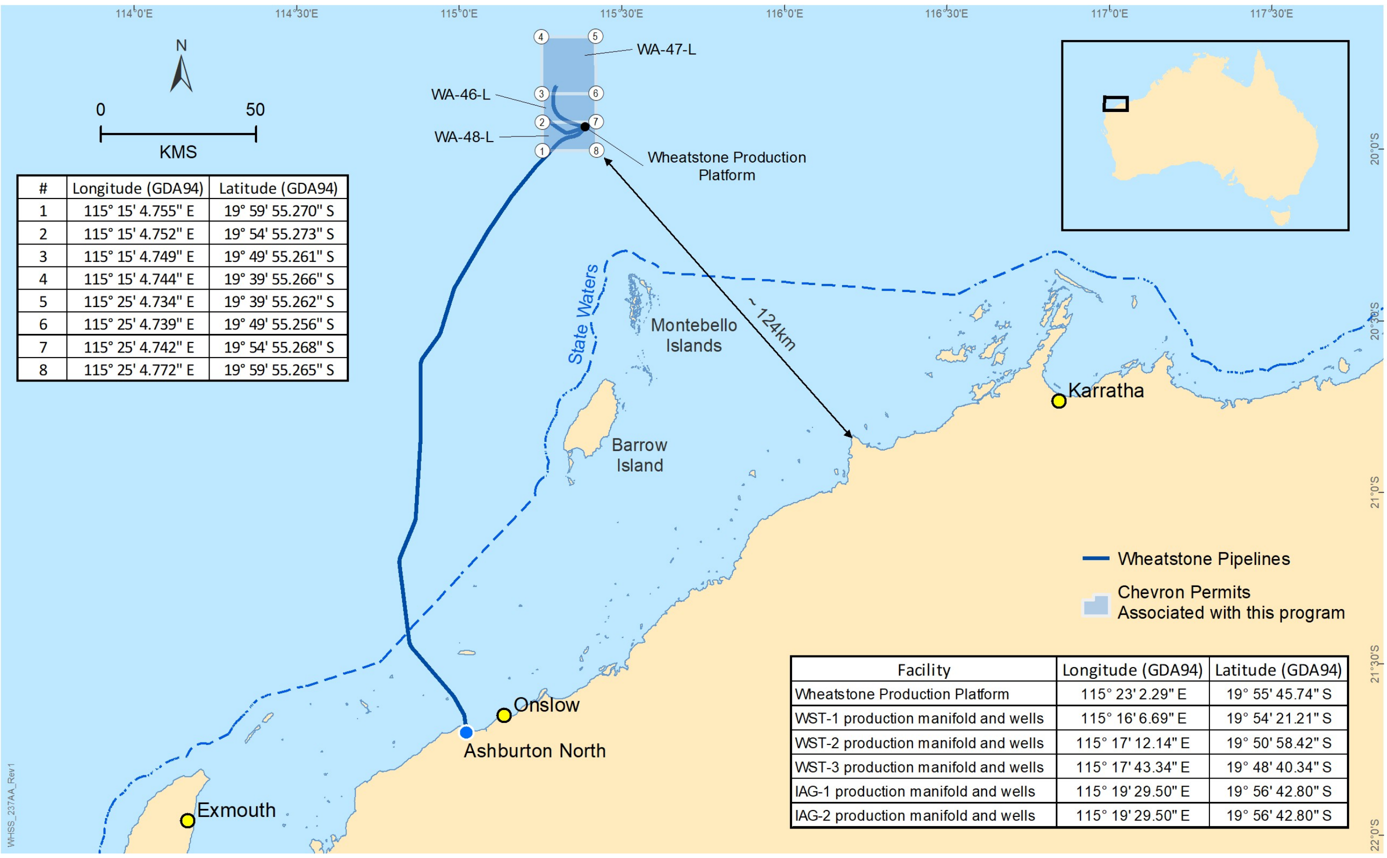
the human energy company™

appendix b stakeholder engagement—fact sheets

wheatstone project start-up and operations

environment plan stakeholder consultation

May 2021



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overview

The Chevron Australia-operated Wheatstone Project produces, processes and transports gas and condensate (hydrocarbons) from the Wheatstone and Iago offshore fields to domestic and international markets.

These fields are located within production licenses WA-46-L, WA-47-L and WA-48-L.

Chevron Australia also processes third-party hydrocarbons from the Julimar-Brunello offshore gas field.

Hydrocarbons from the offshore subsea wells is transported by a flowline system to the Wheatstone Platform for processing and is then routed through a subsea trunkline to the onshore gas plant at Ashburton North, approximately 12 kilometres south west of Onslow, Western Australia (Figure 1).

Processed liquefied natural gas (LNG) and condensate are then exported from Ashburton North via cargo vessels, while domestic gas is supplied via a tie-in to the Dampier-to-Bunbury Natural Gas Pipeline.

Supply vessels support the Platform and transfer miscellaneous items including chemicals, diesel and water to service the platform via cranes and bunker hoses.

This factsheet is for the purpose of stakeholder consultation for a required 5-year revision and resubmission of the original *Wheatstone Start-up and Operations Environment Plan,* approved by NOPSEMA and DMIRS in 2016.

location and water depths

The subsea gathering system delivers hydrocarbons from the wells through the flowlines to the platform. Ocean depths in the hydrocarbon gathering area range from approximately 70 to 280 metres.

The platform is located at Latitude: 19° 55’ 45.78” S; Longitude: 115° 23’ 02.22” E, in approximately 70 metres water depth and includes a four-legged steel gravity structure which supports the topsides.

The platform comprises hydrocarbon processing systems, power generation systems, flare structure, seawater system, wastewater treatment systems, living quarters and other systems and utilities. The normal operational crew on the platform is 55 and may occasionally reach up to 104. The platform is well-lit, meeting safety and navigational requirements.

The carbon steel trunkline (44 inches in diameter, approximately 225 kilometres in length) carries dry gas and condensate from the platform to the onshore facility. The trunkline is located predominately in Commonwealth Waters and follows the 110 metres water depth contour for much of its length, crossing into State Waters before passing under the WA shoreline through a tunnel, travelling a further one kilometre underground then emerging above ground and into the onshore gas plant.

Table 1: Key infrastructure locations and water depths, as marked on nautical maps.

Infrastructure	Latitude South	Longitude East	Depth (m)
Wheatstone Production Platform	19° 55' 45.74"	115° 23' 2.29"	70
WST-1 production manifold and wells	19° 54' 21.21"	115° 16' 6.69"	183
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exclusion zones

Currently a number of exclusion zones are in place for the Wheatstone Project. A 500 m petroleum safety zone is in place around the infrastructure in table above.

No new exclusion or petroleum safety zones (PSZs) are proposed over Chevron Australia’s wells or infrastructure.

As part of its consultation in 2020, Woodside Energy Limited confirmed, like the existing Brunello production wells and crossover manifold (which deliver hydrocarbons to the Chevron-operated Wheatstone Platform), the Julimar production wells and crossover manifold will also have 250m PSZs in place.

environment plan approvals

In 2016, the original *Wheatstone Start-up and Operations Environment Plan* was approved by NOPSEMA and DMIRS.

In accordance with the Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009 and Petroleum Pipelines (environment) Regulations 2021, an Environment Plan is subject to a five-yearly review and resubmission to NOPSEMA and DMIRS.

Consequently, the *Wheatstone Start-up and Operations Environment Plan* is being updated to reflect contemporary regulatory guidance, along with any learnings and risk reduction controls gained during the previous five years of operation.

The Environment Plan describes the environment in which the petroleum activity takes place, an assessment of the impacts and risks arising from the activity, and the identification of control measures to manage the potential impacts and risks to levels that are acceptable and as low as reasonably practicable.

The Environment Plan is also required to outline how Chevron Australia has engaged with key relevant stakeholders, whose interests, functions and activities may be affected.

implications for stakeholders

The potential impacts and risks to the environment and, along with a list of the control measures currently being implemented are summarised in Table 2.

Further details will be provided in the Environment Plan and will incorporate feedback received from stakeholders during this consultation process.

table 2: summary of relevant aspects and proposed controls

Aspect	Proposed Control
Physical Presence	• Relevant stakeholders will be advised of the commencement of key phases of activities and any relevant exclusion zone information. • Vessels will meet the crew competency, navigation equipment, and radar requirements as per the Chevron Australia's Marine, Safety Reliability and Efficiency process. • Vessels will implement caution and no approach zones in accordance with Australian National Guidelines for Whale and Dolphin Watching 2017. • Platform radar, navigational lighting and audio navigational equipment is maintained in accordance with manufacturers' specifications as detailed in the Computerised Maintenance Management System (CMMS). Implementation of a Conservation Significant Marine Fauna Interaction Management Plan.
Planned Discharges	**Vessels** • Oily bilge water is stored / retained on board for controlled disposal or discharged in accordance with MARPOL 73/78, Annex I • Offshore discharge of sewage from vessels in accordance with MARPOL Annex IV • Food waste discharged in accordance with MARPOL, Annex V, or taken to shore for disposal • Chevron Australia's Marine, Safety Reliability and Efficiency process for vessel inspections implemented. **Platform** • Production chemicals subject to Chevron Australia's chemical selection process – ABU Hazardous Material Approval Procedure • Platform Wastewater Discharges Monitoring Program is implemented • Produced water treatment system is operational and maintained in accordance with manufacturers' specifications as detailed in the CMMS. • Total Petroleum Hydrocarbon (TPH) analysis completed on a routine basis. • Produced Water Operating Manual tiered response and Produced Water - High Oil in Water Procedure are implemented • Sewage treatment plant and food waste macerator are operated and maintained • An oil-water treatment system is operated and maintained on the Platform

	• The seawater system (continuous dosing) meets residual chlorine discharge limits and ongoing monitoring is performed.
Air Emissions	**Vessels** • Vessels will hold a valid International Air Pollution Prevention certificate and a current international energy efficiency certificate. • All vessels (as appropriate to vessel class) will have a Ship Energy Efficiency Management Plan as per MARPOL 73/78 Annex VI. • Chevron Australia's Marine, Safety Reliability and Efficiency process for vessel inspections implemented. **Platform** • Energy efficient design features (including the waste heat recovery units, high integrity valves and flanges, seawater lift pump configuration, aero derivative turbines, variable compression modes, condensate export pumps with variable speed drive) are installed and tested • Computerised maintenance management system utilised for the Platform • Platform air emissions monitoring program implemented • Flare monitoring and minimisation program implemented.
Introduced Marine Pests	• Chevron Australia's Quarantine Procedure – Marine Vessels is implemented • Maritime Arrivals Reporting System - Vessels coming from overseas will have Commonwealth Department of Agriculture, Water and the Environment clearance • In accordance with Australian Ballast Water Requirements, vessels coming from overseas will not discharge high-risk ballast water inside Australia's territorial sea (the area within 12 nautical miles of the Australian coastal baseline) • Marine vessels are to maintain an up-to-date international antifouling coating certification • Biofouling management plan, record book and risk assessment implemented.
Weeds	• License area is inspected for the presence of declared or new weed species.
Vessel Spills	• Chevron Australia's Marine, Safety Reliability and Efficiency process • Operational and scientific monitoring undertaken in accordance with the Operational and Scientific Monitoring Plan • Spill response implemented in accordance with the response arrangements and strategies detailed in the Oil Pollution Emergency Plan.
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Feedback from the interested and relevant stakeholders on potential or perceived impacts associated with Chevron Australia's ongoing Wheatstone Project operations will be carefully considered and assessed.

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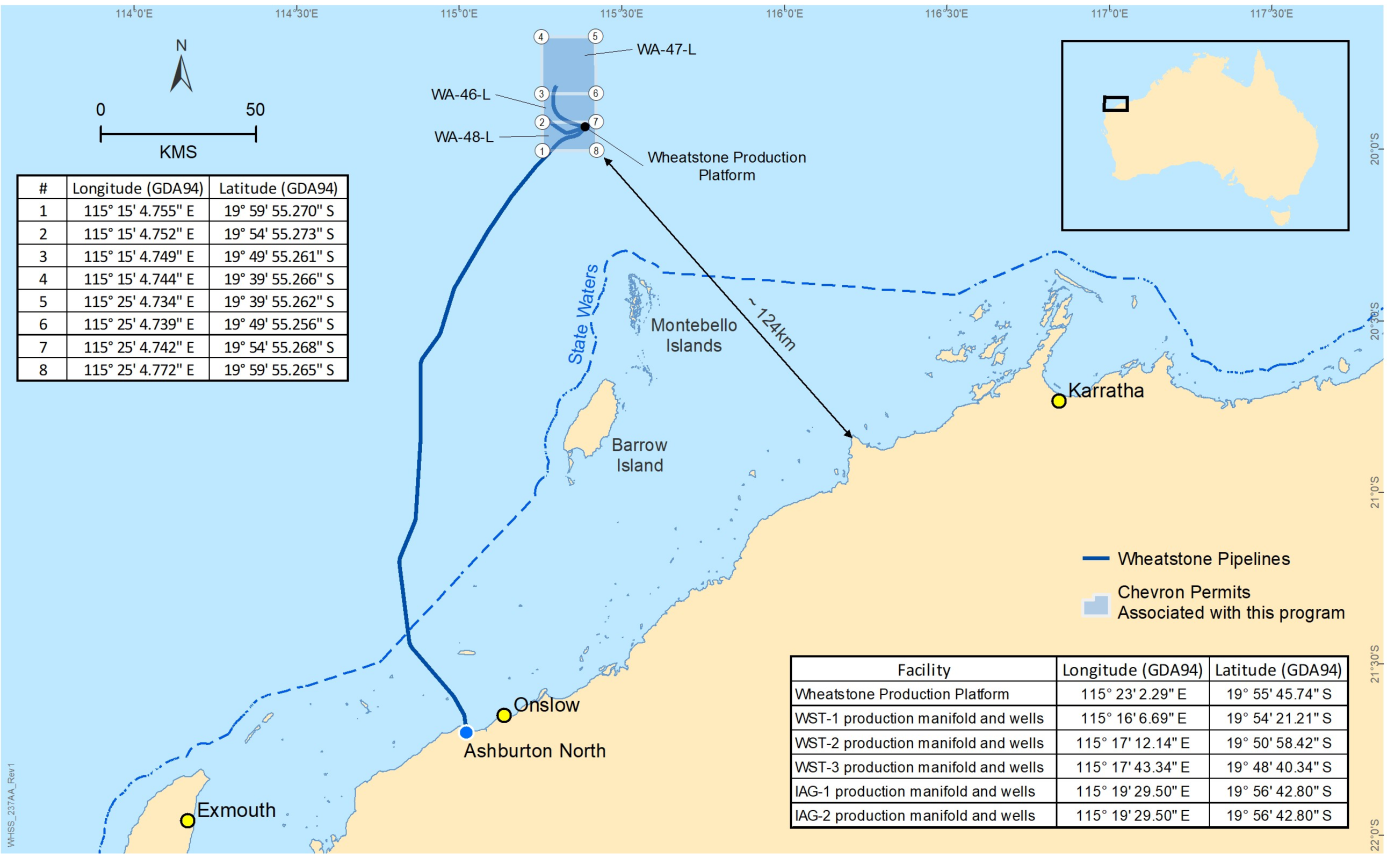
wheatstone project start-up and operations

environment plan commercial fishing consultation

May 2021



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The Environment Plan is also required to outline how Chevron Australia has engaged with the commercial fishing sector as key relevant stakeholders, whose interests, functions and activities may be affected. The Environment Plan must include how commercial fisher feedback has been considered and addressed.

commercial fishing

Chevron Australia recognises the commercial fishing sector is an important and relevant stakeholder group whose members may have interests, functions, and activities that could be affected by this ongoing activity.

Chevron Australia is committed to engaging and working proactively with the commercial fishing sector, with information included in this fact sheet developed with advice from the Western Australia Fishing Industry Council.

On-the-water communications and cooperation between Chevron staff, contractors and sub-contractors and the commercial fishing sector is a Chevron Australia priority.

Chevron staff, contractors and sub-contractors will be made aware of the potential to engage with active commercial fishers, and where possible, support vessels will steer clear of commercial fishing activities and fish aggregations in the vicinity of active commercial fishing vessels.

Support vessel personnel will be prohibited from any recreational fishing activities.

implications for stakeholders

The potential impacts and risks to the environment and the commercial fishing sector, along with a list of the control measures currently being implemented are summarised in Table 2.

Further details will be provided in the Environment Plan and will incorporate feedback received from commercial fishers during this consultation process.

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Aspect	Proposed Control
Physical Presence	• Relevant commercial fishers will be advised of the commencement of key phases of activities and any relevant exclusion zone information. • Vessels will meet the crew competency, navigation equipment, and radar requirements as per the Chevron Australia's Marine, Safety Reliability and Efficiency process. • Vessels will implement caution and no approach zones in accordance with Australian National Guidelines for Whale and Dolphin Watching 2017. • Platform radar, navigational lighting and audio navigational equipment is maintained in accordance with manufacturers' specifications as detailed in the Computerised Maintenance Management System (CMMS). Implementation of a Conservation Significant Marine Fauna Interaction Management Plan.
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appendix c subsea inventory

The following table provides the status of subsea infrastructure associated with the Wheatstone Project (current as of August 2021).

Item	Status	IM Plan	EP reference
Wells			
WST-1A	Currently utilised	In place	Section 3.2.1.1
WST-1C	Currently utilised	In place	Section 3.2.1.1
WST-1D	Currently utilised	In place	Section 3.2.1.1
WST-3A-ST1	Currently utilised	In place	Section 3.2.1.1
WST-3C	Currently utilised	In place	Section 3.2.1.1
WST-3D	Currently utilised	In place	Section 3.2.1.1
WST-3F	Currently utilised	In place	Section 3.2.1.1
IAG-1B-ST1	Currently utilised	In place	Section 3.2.1.1
IAG-1E	Currently utilised	In place	Section 3.2.1.1
Manifolds			
WST-1 manifold	Currently utilised	In place	Section 3.2.1.1
WST-2 manifold	Currently utilised	In place	Section 3.2.1.1
WST-3 manifold	Currently utilised	In place	Section 3.2.1.1
WST-4 manifold	Currently utilised	In place	Section 3.2.1.1
IAG-1 manifold	Currently utilised	In place	Section 3.2.1.1
IAG-2 manifold	Currently utilised	In place	Section 3.2.1.1
Pipeline termination structures			
End of line PTS (3)	Currently utilised	In place	Section 3.2.1.4
Midline PTS (3)	Currently utilised	In place	Section 3.2.1.4
Production pipelines, flowlines, and support infrastructure			
44” trunkline (1)	Currently utilised	In place	Section 3.2.1.5
24” production flowlines (2)	Currently utilised	In place	Section 3.2.1.2
6” MEG pipelines (2)	Currently utilised	In place	Section 3.2.1.2
14” utility pipelines (2)	Currently utilised	In place	Section 3.2.1.2
Electrohydraulic/chemical umbilicals (3)	Currently utilised	In place	Section 3.2.1.3
Platform			
Platform topside—cellar deck, intermediate deck, upper deck	Currently utilised	In place	Section 3.3
Topside structure and equipment—helideck (1), crane (2)	Currently utilised	In place	Section 3.3
Foundations and steel gravity structures (4)	Currently utilised	In place	Section 3.3
Risers—trunkline riser (1), MEG riser (2), production flowline riser (2), utility flowline riser (2)	Currently utilised	In place	Section 3.3

appendix d description of the environment (CAPL planning area)

appendix e protected matters search reports

Australian Government
Department of Agriculture, Water and the Environment

OPERATIONAL AREA (FIELD)

EPBC Act Protected Matters Report

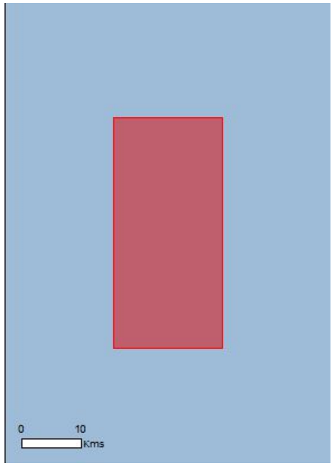
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

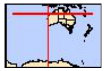
Report created: 29/07/21 23:50:02

- Summary
- Details
  - Matters of NES
  - Other Matters Protected by the EPBC Act
  - Extra Information
- Caveat
- Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 0.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	18
Listed Migratory Species:	34

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	58
Whales and Other Cetaceans:	23
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

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

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
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
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat likely to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur

Name	Threatened	Type of Presence
		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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		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
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

Name	Threatened	Type of Presence
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Reptiles		
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Congregation or aggregation known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat may occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Extra Information

Key Ecological Features (Marine) [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west
Continental Slope Demersal Fish Communities	North-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-19.66535 115.25132,-19.66535 115.41798,-19.99868 115.41798,-19.99869 115.25132,-19.66535 115.25132

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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Australian Government
Department of Agriculture, Water and the Environment

OPERATIONAL AREA (TRUNKLINE)

EPBC Act Protected Matters Report

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

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

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

Report created: 29/07/21 23:52:32

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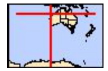

Coordinates
Buffer: 0.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	27
Listed Migratory Species:	46

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	78
Whales and Other Cetaceans:	28
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	1

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

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

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat likely 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 may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may 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	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence
		to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat 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
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	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

Name	Threatened	Type of Presence
		within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat 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
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to 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
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
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
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely 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
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Montebello	Multiple Use Zone (IUCN VI)

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat may occur within area

Key Ecological Features (Marine) [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-19.99869 115.27632,-20.04824 115.22535,-20.12926 115.15394,-20.23332 115.07763,-20.39597 114.97288,-20.52832 114.92756,-20.60703 114.86562,-20.82676 114.86373,-21.06883 114.84432,-21.18553 114.79098,-21.39464 114.81597,-21.42181 114.81917,-21.43051 114.82162,-21.43912 114.82613,-21.56275 114.93597,-21.58479 114.95575,-21.63614 114.98602,-21.64015 114.98756,-21.6817 114.99355

Acknowledgements

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-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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EPBC Act Protected Matters Report

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

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

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

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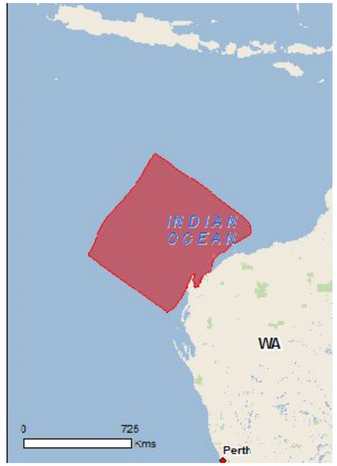

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Coordinates
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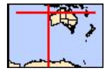

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	43
Listed Migratory Species:	57

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	2
Listed Marine Species:	99
Whales and Other Cetaceans:	31
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	6

Extra Information

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

State and Territory Reserves:	25
Regional Forest Agreements:	None
Invasive Species:	15
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	6

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
The Ningaloo Coast	WA	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
The Ningaloo Coast	WA	Listed place

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
North-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Fish		
Milyeringa veritas Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known 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
Pseudomys fieldi Shark Bay Mouse, Djoongari, Alice Springs Mouse [113]	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus zastictus Hamelin Ctenotus [25570]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to 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
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
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	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - EXMOUTH ADMIN & HF TRANSMITTING
Defence - EXMOUTH VLF TRANSMITTER STATION
Defence - LEARMONTH - RAAF BASE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Learmonth Air Weapons Range Facility	WA	Listed place
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus 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

Name	Threatened	Type of Presence
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans

[Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common		Species or species

Name	Status	Type of Presence
Dolphin [60]		habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area

Name	Status	Type of Presence
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Gascoyne	National Park Zone (IUCN II)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Airlie Island	WA
Barrow Island	WA
Bessieres Island	WA
Boodie, Double Middle Islands	WA
Bundegi Coastal Park	WA
Burnside And Simpson Island	WA
Cape Range	WA
Giralia	WA
Gnandaroo Island	WA
Jurabi Coastal Park	WA
Locker Island	WA
Lowendal Islands	WA
Montebello Islands	WA
Muiron Islands	WA
Round Island	WA
Serrurier Island	WA
Tent Island	WA
Unnamed WA40322	WA
Unnamed WA40828	WA
Unnamed WA41080	WA
Unnamed WA44665	WA
Victor Island	WA
Whalebone Island	WA
Whitmore,Roberts,Doole Islands And Sandalwood Landing	WA
Y Island	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat may occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Cape Range Subterranean Waterways	WA
Exmouth Gulf East	WA

Key Ecological Features (Marine) [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-23.907 112.5549,-23.9219 112.4687,-23.9219 112.427,-23.8951 112.3735,-20.7561 107.6852,-20.7191 107.699,-19.0474 108.4761,-18.4873 108.8762,-17.79 109.4877,-17.63 109.6763,-16.4298 110.7221,-15.5954 111.2194,-15.1439 111.4423,-14.8511 111.7379,-16.5327 114.3741,-18.4018 116.9244,-19.019 117.5916,-19.3176 117.6351,-19.4574 117.6291,-19.5229 117.5577,-19.664 117.3107,-19.6656 117.3079,-19.8025 116.948,-19.9809 116.6297,-20.091 116.4691,-20.4747 116.0289,-20.555 115.8505,-20.7215 115.6542,-20.9238 115.4073,-21.0457 115.3002,-21.3223 115.2378,-21.5186 115.1902,-21.6336 115.1054,-21.6865 115.0562,-21.6745 114.9933,-21.6743 114.9923,-21.6741 114.9913,-21.6707 114.9734,-21.689 114.9173,-21.7919 114.7757,-21.7994 114.7209,-21.8447 114.6493,-21.9143 114.6458,-21.9456 114.6167,-21.9797 114.615,-22.0025 114.5701,-22.0162 114.576,-22.0269 114.5535,-22.0602 114.548,-22.0486 114.5447,-22.0541 114.5397,-22.0553 114.5395,-22.0606 114.5479,-22.0632 114.5475,-22.0668 114.5167,-22.0845 114.5299,-22.1222 114.5224,-22.1293 114.501,-22.1701 114.5058,-22.1555 114.481,-22.1598 114.4556,-22.2119 114.4944,-22.2088 114.4526,-22.234 114.4515,-22.2417 114.4595,-22.2382 114.4509,-22.2467 114.4598,-22.2427 114.443,-22.2717 114.4581,-22.274 114.4294,-22.2931 114.4559,-22.3004 114.4237,-22.3314 114.408,-22.3466 114.4245,-22.343 114.4437,-22.3518 114.4306,-22.3572 114.4402,-22.3512 114.4062,-22.3841 114.3965,-22.3935 114.4158,-22.3904 114.3932,-22.4269 114.3974,-22.4328 114.3847,-22.4394 114.3946,-22.4423 114.3798,-22.4593 114.3916,-22.501 114.3552,-22.4793 114.3247,-22.4873 114.3193,-22.435 114.3088,-22.4573 114.2256,-22.4973 114.2187,-22.5239 114.1808,-22.5249 114.1551,-22.4741 114.1217,-22.4134 114.1223,-22.4099 114.1403,-22.3976 114.1464,-22.3978 114.1311,-22.3567 114.177,-22.3057 114.178,-22.3017 114.1501,-22.3297 114.1149,-22.2622 114.1328,-22.1925 114.0848,-22.155 114.0803,-21.9581 114.138,-21.8659 114.1488,-21.8135 114.1912,-21.7851 114.1642,-21.8155 114.0799,-21.8744 113.9963,-21.9751 113.933,-22.3139 113.8177,-22.4076 113.7502,-22.4715 113.7384,-22.4969 113.7233,-22.4968 113.7077,-22.5177 113.7138,-22.5504 113.6646,-22.5789 113.6539,-22.7208 113.5926,-23.0296 113.4591,-23.6661 112.9713,-23.907 112.5549

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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EEA

EPBC Act Protected Matters Report

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

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

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

Report created: 02/08/21 18:05:26

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 0.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	53
Listed Migratory Species:	68

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	4
Listed Marine Species:	125
Whales and Other Cetaceans:	33
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	15

Extra Information

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

State and Territory Reserves:	28
Regional Forest Agreements:	None
Invasive Species:	15
Nationally Important Wetlands:	3
Key Ecological Features (Marine)	10

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
The Ningaloo Coast	WA	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Natural		
The Ningaloo Coast	WA	Listed place
Historic		
HMAS Sydney II and HSK Kormoran Shipwreck Sites	EXT	Listed place

Commonwealth Marine Area [Resource Information]

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

Name
EEZ and Territorial Sea
Extended Continental Shelf

Marine Regions [Resource Information]

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

Name
North-west
South-west

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Malurus leucopterus edouardi White-winged Fairy-wren (Barrow Island), Barrow Island Black-and-white Fairy-wren [26194]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Milyeringa veritas Blind Gudgeon [66676]	Vulnerable	Species or species habitat known to occur within area
Ophisternon candidum Blind Cave Eel [66678]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Bettongia lesueur Barrow and Boodie Islands subspecies Boodie, Burrowing Bettong (Barrow and Boodie Islands) [88021]	Vulnerable	Species or species habitat known to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Isoodon auratus barrowensis Golden Bandicoot (Barrow Island) [66666]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes conspicillatus conspicillatus Spectacled Hare-wallaby (Barrow Island) [66661]	Vulnerable	Species or species habitat known to occur within area
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Translocated population known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known 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
Pseudomys fieldi Shark Bay Mouse, Djoongari, Alice Springs Mouse [113]	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
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	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding likely to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sternula albifrons Little Tern [82849]		Congregation or aggregation known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Breeding known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - EXMOUTH ADMIN & HF TRANSMITTING
Defence - EXMOUTH VLF TRANSMITTER STATION
Defence - LEARMONTH - RAAF BASE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Learmonth Air Weapons Range Facility	WA	Listed place
Mermaid Reef - Rowley Shoals	WA	Listed place
Ningaloo Marine Area - Commonwealth Waters	WA	Listed place
Historic		
HMAS Sydney II and HSK Kormoran Shipwreck Sites	EXT	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Papasula abbotti Abbott's Booby [59297]	Endangered	Species or species habitat may occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Breeding likely to occur within area
Phaethon rubricauda Red-tailed Tropicbird [994]		Breeding known to occur within area
Pterodroma macroptera Great-winged Petrel [1035]		Foraging, feeding or related behaviour known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Congregation or aggregation known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area

Name	Threatened	Type of Presence
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bhanotia fasciolata Corrugated Pipefish, Barbed Pipefish [66188]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Cosmocampus banneri Roughridge Pipefish [66206]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Mammals		
Dugong dugon Dugong [28]		Breeding known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera bonaerensis Antarctic Minke Whale, Dark-shoulder Minke Whale [67812]		Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Migration route known to occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Feresa attenuata Pygmy Killer Whale [61]		Species or species habitat may occur within area
Globicephala macrorhynchus Short-finned Pilot Whale [62]		Species or species habitat may occur within area
Globicephala melas Long-finned Pilot Whale [59282]		Species or species habitat may occur within area

Name	Status	Type of Presence
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Indopacetus pacificus Longman's Beaked Whale [72]		Species or species habitat may occur within area
Kogia breviceps Pygmy Sperm Whale [57]		Species or species habitat may occur within area
Kogia simus Dwarf Sperm Whale [58]		Species or species habitat may occur within area
Lagenodelphis hosei Fraser's Dolphin, Sarawak Dolphin [41]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Breeding known to occur within area
Mesoplodon densirostris Blainville's Beaked Whale, Dense-beaked Whale [74]		Species or species habitat may occur within area
Mesoplodon ginkgodens Gingko-toothed Beaked Whale, Gingko-toothed Whale, Gingko Beaked Whale [59564]		Species or species habitat may occur within area
Mesoplodon grayi Gray's Beaked Whale, Scamperdown Whale [75]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Peponocephala electra Melon-headed Whale [47]		Species or species habitat may occur within area
Physeter macrocephalus Sperm Whale [59]		Species or species habitat may occur within area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Stenella coeruleoalba Striped Dolphin, Euphrosyne Dolphin [52]		Species or species habitat may occur within area
Stenella longirostris Long-snouted Spinner Dolphin [29]		Species or species habitat may occur within area
Steno bredanensis Rough-toothed Dolphin [30]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted		Species or species

Name	Status	Type of Presence
Bottlenose Dolphin [68418]		habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area
Ziphius cavirostris Cuvier's Beaked Whale, Goose-beaked Whale [56]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Abrolhos	Habitat Protection Zone (IUCN IV)
Abrolhos	Multiple Use Zone (IUCN VI)
Abrolhos	National Park Zone (IUCN II)
Argo-Rowley Terrace	Multiple Use Zone (IUCN VI)
Argo-Rowley Terrace	National Park Zone (IUCN II)
Argo-Rowley Terrace	Special Purpose Zone (Trawl) (IUCN VI)
Carnarvon Canyon	Habitat Protection Zone (IUCN IV)
Gascoyne	Habitat Protection Zone (IUCN IV)
Gascoyne	Multiple Use Zone (IUCN VI)
Gascoyne	National Park Zone (IUCN II)
Mermaid Reef	National Park Zone (IUCN II)
Montebello	Multiple Use Zone (IUCN VI)
Ningaloo	National Park Zone (IUCN II)
Ningaloo	Recreational Use Zone (IUCN IV)
Shark Bay	Multiple Use Zone (IUCN VI)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Airlie Island	WA
Barrow Island	WA
Bessieres Island	WA
Boodie, Double Middle Islands	WA
Bundegi Coastal Park	WA
Burnside And Simpson Island	WA
Cape Range	WA
Giralia	WA
Gnandaroo Island	WA
Jurabi Coastal Park	WA
Little Rocky Island	WA
Locker Island	WA
Lowendal Islands	WA
Montebello Islands	WA
Muiron Islands	WA
North Sandy Island	WA
Round Island	WA
Serrurier Island	WA
Tent Island	WA
Unnamed WA40322	WA
Unnamed WA40828	WA
Unnamed WA41080	WA
Unnamed WA44665	WA
Unnamed WA44667	WA
Victor Island	WA
Whalebone Island	WA
Whitmore,Roberts,Doole Islands And Sandalwood Landing	WA

Name	State
Y Island	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat may occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Cape Range Subterranean Waterways	WA
Exmouth Gulf East	WA
Mermaid Reef	EXT

Key Ecological Features (Marine) [Resource Information]

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

Name	Region
Ancient coastline at 125 m depth contour	North-west
Canyons linking the Cuvier Abyssal Plain and the	North-west
Commonwealth waters adjacent to Ningaloo Reef	North-west
Continental Slope Demersal Fish Communities	North-west
Exmouth Plateau	North-west
Glomar Shoals	North-west
Mermaid Reef and Commonwealth waters	North-west
Wallaby Saddle	North-west
Perth Canyon and adjacent shelf break, and other	South-west
Western demersal slope and associated fish	South-west

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-15.8745 118.6098,-16.5696 120.0194,-17.5519 119.4558,-19.8539 118.0387,-20.3026 116.7861,-20.3787 116.61,-20.4501 116.5006,-21.2305 115.663,-21.5769 115.2415,-21.6418 115.1452,-21.6336 115.1054,-21.6865 115.0562,-21.6743 114.9923,-21.6707 114.9734,-21.689 114.9173,-21.7919 114.7757,-21.7994 114.7209,-21.8447 114.6493,-21.9143 114.6458,-21.9456 114.6167,-21.9797 114.615,-22.0025 114.5701,-22.0162 114.576,-22.0269 114.5535,-22.0602 114.548,-22.0606 114.5479,-22.0632 114.5475,-22.0668 114.5167,-22.0845 114.5299,-22.1222 114.5224,-22.1293 114.501,-22.1701 114.5058,-22.1555 114.481,-22.1598 114.4556,-22.2119 114.4944,-22.2088 114.4526,-22.234 114.4515,-22.2417 114.4595,-22.2382 114.4509,-22.2467 114.4598,-22.2427 114.443,-22.2717 114.4581,-22.274 114.4294,-22.2931 114.4559,-22.3004 114.4237,-22.3314 114.408,-22.3466 114.4245,-22.343 114.4437,-22.3518 114.4306,-22.3572 114.4402,-22.3512 114.4062,-22.3841 114.3965,-22.3935 114.4158,-22.3904 114.3932,-22.4269 114.3974,-22.4328 114.3847,-22.4394 114.3946,-22.4423 114.3798,-22.4593 114.3916,-22.501 114.3552,-22.4793 114.3247,-22.4873 114.3193,-22.435 114.3088,-22.4573 114.2256,-22.4973 114.2187,-22.5239 114.1808,-22.5249 114.1551,-22.4741 114.1217,-22.4134 114.1223,-22.4099 114.1403,-22.3976 114.1464,-22.3978 114.1311,-22.3567 114.177,-22.3057 114.178,-22.3017 114.1501,-22.3297 114.1149,-22.2622 114.1328,-22.1925 114.0848,-22.155 114.0803,-21.9581 114.138,-21.8659 114.1488,-21.8135 114.1912,-21.7851 114.1642,-21.8155 114.0799,-21.8744 113.9963,-21.9751 113.933,-22.3139 113.8177,-22.4076 113.7502,-22.4715 113.7384,-22.4969 113.7233,-22.4968 113.7077,-22.5177 113.7138,-22.5504 113.6646,-22.5789 113.6539,-22.5956 113.6733,-22.628 113.6681,-22.6647 113.6863,-22.7174 113.6706,-22.7156 113.7104,-22.7552 113.7549,-22.9535 113.8262,-23.0351 113.8292,-23.0827 113.8132,-23.1214 113.761,-24.2027 113.2556,-24.9157 112.9085,-25.3472 112.7865,-25.7694 112.824,-27.4393 112.946,-27.8615 112.9648,-28.0773 112.8897,-28.2836 112.6458,-28.5182 112.1861,-28.5557 111.839,-28.4338 111.5669,-28.1242 111.2198,-27.1297 110.3098,-25.907 109.2673,-24.6155 108.3115,-23.7711 107.9456,-22.8236 107.6266,-22.0074 107.4109,-21.7647 107.4033,-20.2783 107.802,-18.5604 108.7923,-17.2669 109.9544,-16.3776 110.7528,-15.5591 111.2277,-14.8921 111.6218,-14.4475 112.309,-14.3667 113.1376,-14.0029 114.0269,-13.2349 114.7545,-13.4976 115.1284,-13.7352 115.2573,-13.8808 115.3411,-13.9864 115.401,-14.3363 115.5629,-14.7507 115.4922,-15.3154 116.0336,-15.4645 116.1905,-15.4427 116.2083,-14.9332 116.7244,-14.8651 116.8116,-14.7706 116.9429,-15.8745 118.6098

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-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
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-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
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-Other groups and individuals

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Please feel free to provide feedback via the Contact Us page.

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