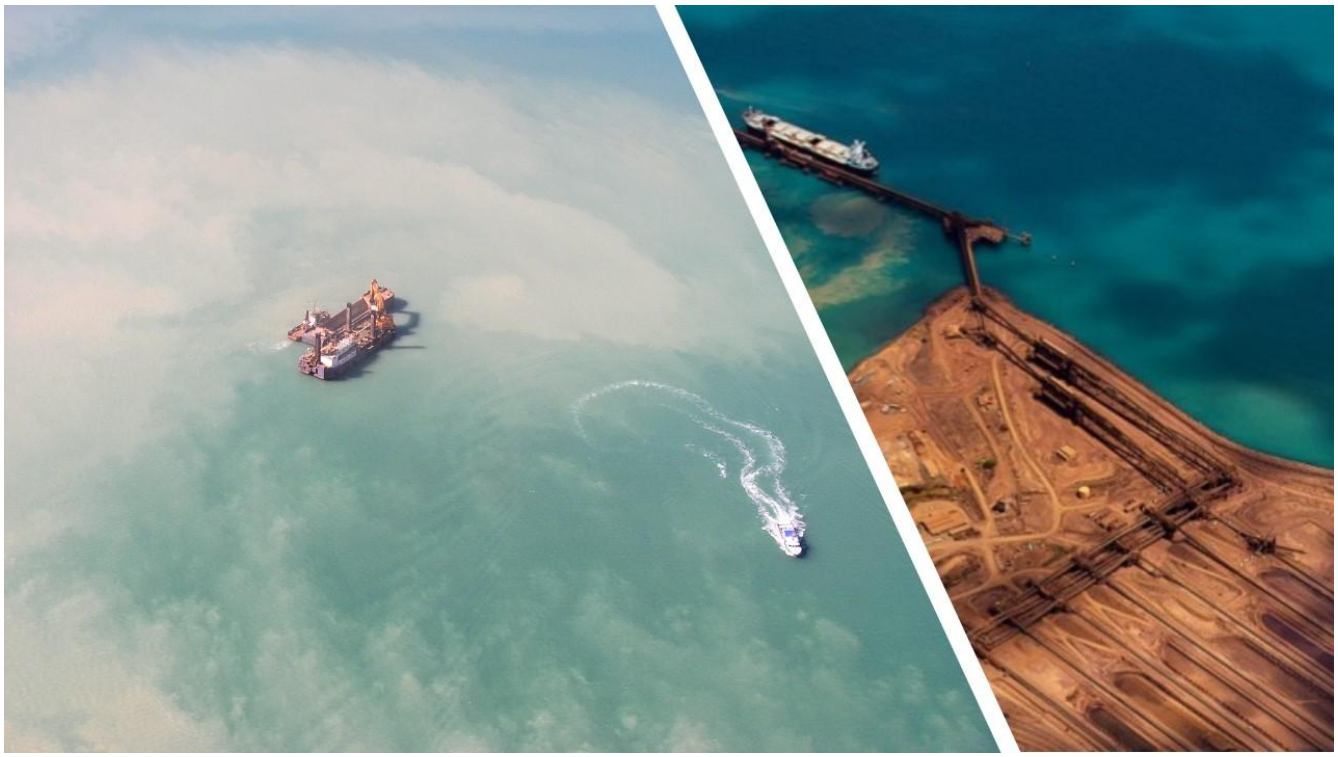
Dampier Port Maintenance Dredging



22 April 2026

Long Term Monitoring and Management Plan

Document Information

REPORT NO.	MSA340R01
DATE	April 22, 2026
CLIENT	Pilbara Iron Company Pty Ltd
DOCUMENT TITLE	Dampier Port Maintenance Dredging Long Term Monitoring and Management Plan
USAGE	This Long Term Monitoring and Management Plan (LTMMP) for maintenance dredging has been developed to set out the monitoring and management actions under a (ten year) Long Term Sea Dumping Permit. The LTMMP has been developed in accordance with the requirements of the 2009 National Assessment Guidelines for Dredging and Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) requirements for long term sea dumping permits.
KEYWORDS	Dredging, management, Dampier
CITATION	MScience 2026. Dampier Port Maintenance Dredging Long Term Monitoring and Management Plan. Unpublished report MSA340R01 to Pilbara Iron Company Pty Ltd, Perth Western Australia, pp141

Version History

Version/Date	Issued as	Author	Reviewed	Approved
1/26.02.2025	Draft for client review	IJP	JAS	IJP
2/09.07.2025	Final draft – client comments addressed	IJP	JAS	IJP
3/12.11.2025	Final	IJP	MJF	IJP
4/15.01.2026	Updated in response to DCCEEW comments	IJP	JAS	IJP
5/22.04.2026	Updated marine fauna management	IJP	MJF	IJP

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Acronyms and Abbreviations

Abbreviation	Definition
AC	Almost Certain
AIS	Automated Identification System
AMSA	Australian Maritime Safety Authority
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
BC Act	*Biodiversity Conservation Act 2016*
BHD	Back-hoe Dredge
BIA	Biologically Important Area
BPPH	Benthic Primary Producer Habitats
CALM	*Conservation and Land Management Act 1984*
CAMBA	China Australia Migratory Bird Agreement
CD	Chart Datum
CITIES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DAF	Commonwealth Department of Agriculture and Fisheries
DAMP	Dampier Archipelago Marine Park
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEED	Department of Energy & Economic Diversification
DER	Department of Water and Environmental Regulation
DoF	Department of Fisheries
DoP	Department of Planning
DTMI	Department of Transport and Major Infrastructure
DPA	Dampier Port Authority (now Pilbara Ports)
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSD	Department of State Development
DWER	Department of Water and Environmental Regulation
EAA	East Asian–Australian
EIA	Environmental Impact Assessment
EII	East Intercourse Island
EMP	Environmental Management Plan
EMS	Environmental Management System
ERA	Environmental Risk Assessment
FID	Frequency Intensity Duration
GPS	Geographical Positioning System
HSEQ	Health, Safety, Environment and Quality
IMS	Invasive Marine Species
IUCN	International Union Conservation of Nature
JAMBA	Japan Australia Migratory Bird Agreement
L	Likely
LAT	Lowest Astronomical Tide
LTMMP	Long Term Monitoring and Management Plan
MMA	Mermaid Marine Australia
MNES	Matters of National Environmental Significance
NAGD	National Assessment Guidelines for Dredging
NWSJV	North West Shelf Joint Venture

Abbreviation	Definition
PAH	Polycyclic Aromatic Hydrocarbons
Pilbara Ports	Previously Pilbara Ports Authority
PMST	Protected Matters Search Tool
PP	Parker Point
PPA	Pilbara Ports Authority (now Pilbara Ports)
R	Rare
RTIO	Rio Tinto Iron Ore
SAP	Sampling and Analysis Plan
SDP	Sea Dumping Permit
SST	Sea Surface Temperature
TACC	Technical Advisory and Consultative Committee
TRH	Total Recoverable Hydrocarbons
TSHD	Trailer Suction Hopper Dredge
TSS	Total Suspended Sediments
U	Unlikely
UCL	Upper Confidence Limit

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1 INTRODUCTION

1.1 Document Purpose

Pilbara Iron Pty Ltd (Pilbara Iron, the Proponent) intends to carry out maintenance and emergency dredging of its port infrastructure within the Port of Dampier (Figure 1-1) under a ten-year Sea Dumping Permit (SDP). The Proponent is a wholly owned company of Rio Tinto Limited (Rio Tinto) and is a management arm for the Rio Tinto Iron Ore product group that operates and maintains all mining, rail, power and port facilities in the Pilbara wholly owned and joint venture operations.

This Long Term Monitoring and Management Plan (LTMMP) has been developed to manage the environmental performance of maintenance dredging that may be carried out under the ten-year SDP. Maintenance dredging within the berths, swing basins and departure channels associated with the Parker Point (PP) and East Intercourse Island (EII) port facilities in the Port of Dampier is required to maintain the design depths of these areas, so that they remain navigable.

This LTMMP provides a framework for the development of specific monitoring and management programs to ensure environmental targets and permit conditions are met for the ocean disposal of maintenance dredging spoil by the Proponent over the lifetime of a ten-year SDP.

In order to identify whether proposed dredge material is suitable for ocean disposal, physical and chemical analysis of the sediment to be dredged is required to demonstrate it is of low risk. Choice of the disposal site must also be guided by physical, chemical and biological parameters, so that the potential impacts of sea disposal can be identified, minimised and monitored as appropriate. Safeguards for those actions are addressed within the accompanying SDP application and the sampling and analysis plan (SAP) which sets out how sediment chemistry will be assessed following the end of the currency period for existing data.

1.2 Regulatory Framework

In Australian waters, ocean disposal of dredged material is regulated by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act) by applying the National Assessment Guidelines for Dredging (the NAGD) (Commonwealth of Australia 2009).

The NAGD (2009) contains provision for the granting of SDPs for maintenance dredging on the following basis:

- An assessment of the applicant's capacity to meet their obligations under the Sea Dumping Act and any permit granted;
- Establishment of a Technical Advisory and Consultative Committee (TACC) for long-term management; and
- Development and implementation of a satisfactory LTMMP for the loading and disposal activities, and provide a SAP to support future applications.

This LTMMP has been prepared to ensure compliance with the following legislation, including contingent regulations and advisories:

Commonwealth:

- *Environment Protection (Sea Dumping) Act 1981*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Biosecurity Act 2015*

- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*

State (WA):

- *Environmental Protection Act 1986 (WA)*
- *Biodiversity Conservation Act 2016*
- *Port Authorities Act 1999*
- *Marine and Harbours Act 1981*
- *Western Australian Marine Act 1982*
- *Pollution of Waters by Oil and Noxious Substances Act 1987*
- *Fisheries Resources Management Act 1994 / Aquatic Resources Management Act 2016*

International Conventions:

- *International Convention for the Prevention of Pollution from Ships 1973/1978 (MARPOL 73/78)*
- *International Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter 1972 (London Protocol)*
- *International Convention for the Control and Management of Ships' Ballast Water and Sediments 2004*

Components of the LTMMP are based on guidance obtained from the following sources:

- National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009)
- Western Australian Environmental Protection Authority Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals (EPA 2016a);
- Western Australian Environmental Protection Authority Technical Guidance – Protecting the Quality of Western Australia's Marine Environment (EPA 2016b);
- Western Australian Environmental Protection Authority Technical Guidance – Protection of Benthic Communities and Habitats (EPA 2016c);
- Long Term Monitoring and Management Plan Requirements for 10-year Permits to Dump Maintenance Dredge Material at Sea (Australian Government 2012);
- Current recommendations for monitoring and impact assessments promulgated by the Western Australian Marine Science Institution (WAMSI) Dredging Science Node;
- Australian National Guidelines for Interactions with Whales and Dolphins (Commonwealth of Australia 2017a);
- Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b); and
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018).

1.3 Environmental Management Framework

The Proponent's Port Operations at Dampier are subject to the Rio Tinto Health, Safety, Environment, Security and Communities Policy (Appendix A). The Policy is the guiding document for environmental management and provides context and specific direction for continuous improvement.

Environmental performance at the Dampier Port Operations is managed under Rio Tinto (WA)'s Environmental Management System (EMS) that addresses all activities with a potential to affect the environment. That system is consistent with ISO14001:2015 and its key elements include assessing environmental risk, managing to prevent impacts, monitoring the effectiveness of that management and improving where necessary. The risk assessment process includes undertaking detailed site investigations of the biological and physical environs. Where these investigations identify significant environmental issues,

management measures are incorporated into the dredging design to avoid, where practicable, and/or minimise potential impacts. This LTMMP will fit under the Rio Tinto (WA) EMS.

In compliance with the Rio Tinto (WA) EMS and the DCCEEW objectives for sea dumping, the LTMMP sets out:

- Strategies for the management of waste and alternatives to sea disposal;
- Environmental performance objectives, and management strategies and actions to attain them;
- Monitoring to demonstrate that strategies are effective, and corrective actions to be undertaken should monitoring suggest performance objectives are not being met;
- Contingency planning to cover failure of management actions;
- Mechanisms directed at the continual improvement of performance; and
- Auditing, reporting and review requirements for the above.

1.4 Technical Advisory and Consultative Committee (TACC)

In 2005, the Dampier Port Authority (DPA, now Pilbara Ports) established a TACC to assist in the management of dredging and dredged material disposal activities within the Port of Dampier (the Dampier TACC). This group has been established subject to guidance in the NAGD. Membership of the group is drawn from a variety of stakeholders including:

- Pilbara Ports (Environment and Heritage Manager, Harbour Master and Dredging and Survey Manager, or their representatives).
- Government organisations:
    - Commonwealth DCCEEW;
    - Western Australian Department of Planning, Lands and Heritage (DPLH);
    - Western Australian Department of Energy & Economic Diversification (DEED);
    - Western Australian Department of Primary Industries and Regional Development (DPIRD);
    - Western Australian Department of Biodiversity Conservation and Attractions (DBCA); and
    - Western Australian Department of Transport and Major Infrastructure (DTMI).
- Community Stakeholders:
    - Maxima Rock Oyster; and
    - Murujuga Aboriginal Corporation.
- Port Industry and Users:
    - Rio Tinto – on behalf of the Proponent;
    - Citic Pacific;
    - Water Corporation;
    - Woodside; and
    - Toll Dampier Supply Base.

The Dampier TACC meets twice per annum or more frequently as required, such as might happen during dredging campaigns. The Terms of Reference for the Dampier TACC are available at: www.pilbaraports.com.au. The role of the Dampier TACC is to provide a single point of reference for dredging planning and management in the Port of Dampier, and to facilitate the flow of information from these groups/agencies to and from Port of Dampier stakeholders. The Proponent is an active member of the Dampier TACC and uses that forum for consultation and feedback on its dredging proposals. The Proponent considered the creation of a Proponent specific TACC, but this would impact on the resources of the government organisations, community stakeholders and industry representatives already involved in the Dampier TACC with no additional benefit. The Proponent will continue to use the Dampier TACC to manage dredging related communications, opportunities and issues.

The Dampier TACC is a forum:

- for information to flow to stakeholders, such as forward dredging plans and opportunities to combine resources;
- where a proponent can seek comment on a proposal, such as under the NAGD, with comments collated by the Dampier TACC chair, conflicts resolved and provided back to the proponent for submission to the DCCEEW;
- where members can have input to the forward planning of dredging issues within the port such as spoil ground utilisation; and
- where opportunities to combine resources can be captured, such as joint research.

1.5 Continuous Improvement

Pilbara Iron will implement the following mechanisms in order to identify opportunities for continuous improvement to the maintenance dredging and disposal operations over the life of the 10-year permit:

- Regular review of the content and implementation of this LTMMP.
- Regular consultation and review of the LTMMP with the TACC.
- Audits of the dredge contractor and their operations, as required throughout the life of the SDP, to assess compliance against this LTMMP.

Improvement could refer to physical matters and processes, and include changes to specific actions, operations, responsibilities, resources and timeframes.

Audit and review of this LTMMP will occur as in the following sections.

1.5.1 Audit

The following sections of the LTMMP will form the basis of the audit criteria:

- The Section 6, 7 and 8 management and mitigation actions for each of the monitoring and management frameworks.
- The Section 9 roles and responsibilities.
- The Section 10 reporting requirements.
- The Section 11 deliverable actions.

At a minimum, the Proponent will conduct an internal audit on the above criteria after each dredging campaign implemented under this LTMMP. A compliance audit schedule will be developed based on the conditions/obligations contained within the SDP and any other relevant approval documents.

Activities relating to the dredging and disposal may be audited by DCCEEW to verify that the activities are meeting the specified and defined requirements.

Any independent audits of compliance will be performed by an approved independent auditor, in accordance with any relevant SDP condition.

1.5.2 Review

This LTMMP will be reviewed following:

- issue of the SDP to ensure that all conditions of that permit are covered by relevant management and monitoring.
- in response to any potential significant alteration of the environment in which dredging occurs (e.g. as a result of a major oil spill, or if other port users impact on the area).

- following identification of aspects of the LTMMP that are found not to be functional/efficient.

Any such review will include consultation with the DCCEEW. Any review will be led by the Proponent and will include consultation with the Dampier TACC and Pilbara Ports, depending on the significance of the amendment/s being contemplated.

Primary consideration for the review will include:

- Volume and locations of material dredged to date;
- Assessment of whether the volume to be dredged within the time remaining on the SDP is likely to exceed the permitted amount;
- Effectiveness of waste prevention strategies;
- Continual improvement of port operations relevant to the LTMMP;
- Currency of sediment sampling results and need to implement the SAP;
- Non-conformances as identified during audits; and
- Any other issues that arise during the course of dredging campaigns under this LTMMP/SDP.

The findings of the review and any proposed amendments to the LTMMP will be provided to DCCEEW. The reviewed or revised LTMMP will require approval by DCCEEW prior to being implemented.

1.6 Document Publication

The LTMMP will be made available for public viewing via the Proponent's website for the duration of the permit.

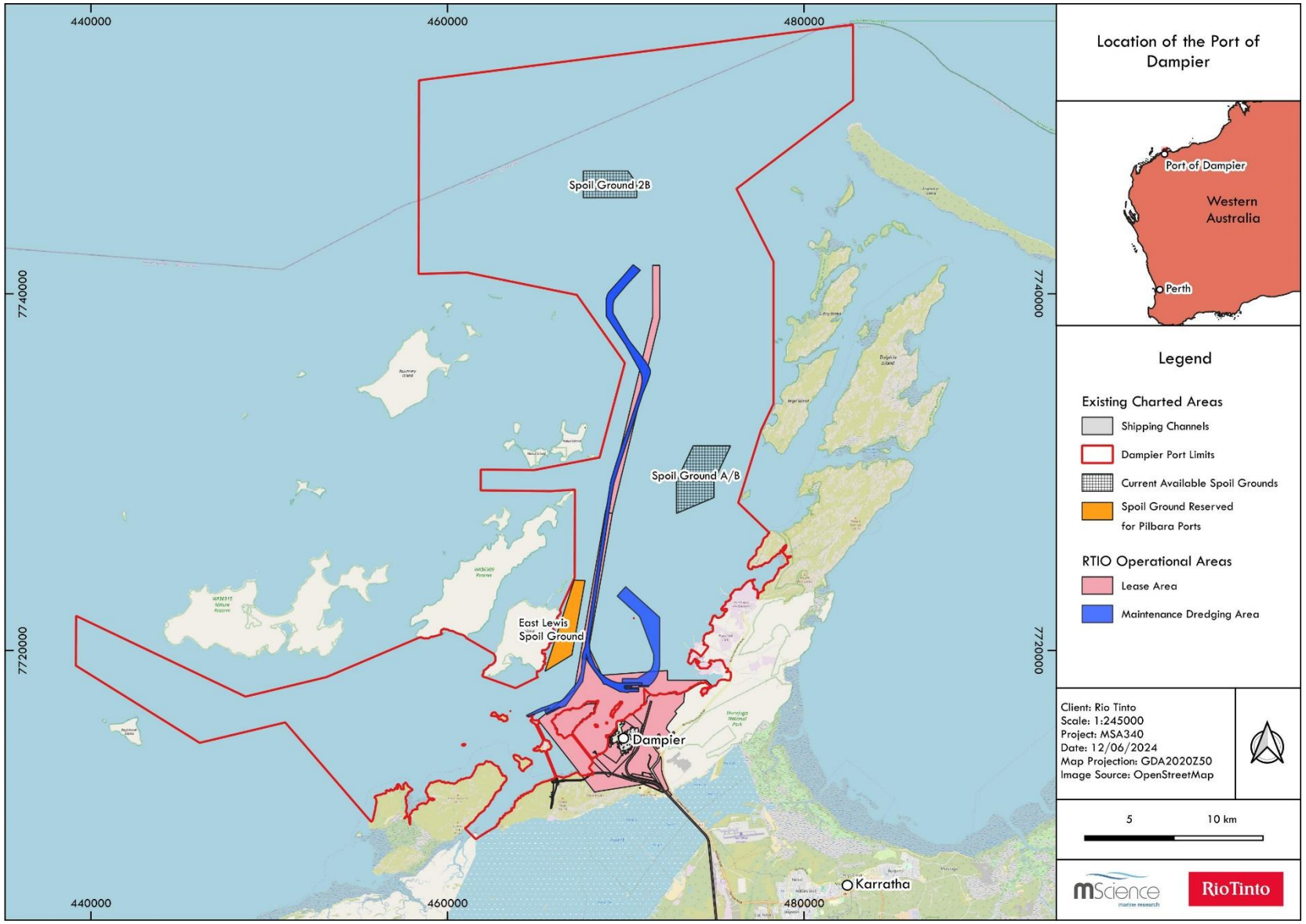

Figure 1-1. Location of the Port of Dampier

2 BACKGROUND ON THE PORT OF DAMPIER

2.1 Locality and Use

The Port of Dampier is located in the Pilbara Region of Western Australia approximately 1,550 kilometres north of Perth on the Burrup Peninsula (Figure 1-1).

The nearest townships are Dampier, located 5 km to the south west of PP, and Karratha, located 20 km to the east. Unlike many other Australian ports, it is not located at the terminus of a river system.

The Port of Dampier exports iron ore, salt, liquefied natural gas, anhydrous ammonia as well as imports of project cargo, fuels, bulk and general cargo. The Proponent exports iron ore from its PP and EII facilities in the port.

The other uses of the port (e.g. cultural, recreational and fisheries) have been described in Section 4.

2.2 Potential Sediment Contaminant Sources

The Port of Dampier is remote from catchment influences such as agricultural and urban runoff due to its physical location on the Burrup Peninsula, distance from major river mouths and location in an area of low annual rainfall.

Shipping and industrial development around parts of the Port's periphery present the primary risk of contaminant introductions to sediments in the proposed dredge area. Existing industries in the Port of Dampier are generally associated with the exploration and production of natural gas and minerals.

2.3 Dredging History

The Port of Dampier was constructed in the mid 1960's to land construction materials and domestic supplies for Hamersley Iron's mine operations and to export iron ore product. Periodic maintenance and capital dredging campaigns have increased the capacity of the Dampier Port Operations to up to160 Mtpa. In the late 1980's, Woodside's North West Shelf Venture (NWSV) selected the area to establish its Karratha Gas Plant and associated port facilities for export. Further development took place in 2007 when Woodside was granted approval for the Pluto LNG Development, including a new port facility.

Table 2-1 details the dredge history of the area.

Table 2-1. Dampier dredging history

Date	Proponent*	Dredging program	SDP Number (if known)+	Dredge Material Volume (m^3)	Spoil Ground
2024	Pilbara Ports	Capital Dredging Dampier Cargo Wharf Extension	SD2022/4025	380,000	East Lewis Island
2023	Woodside	Scarborough Project Nearshore Component	SD2019/3982	608,055	A/B
2019 - 2024	Pilbara Ports Authority (PPA)	Maintenance dredging at PPA's Facilities Channel, swing basin, holding area and associated berth pockets	SD2019/3962	450,000 (permitted)	A/B
2018 - 2025	Pilbara Iron	Maintenance dredging of PP and EII and shipping channels	SD2016/3462	1,225,000 (permitted)	A/B
2016	Pilbara Iron	Maintenance dredging of PP and EII and shipping channels	SD2015/3122	650,000	A/B
2010 – 2012	Pilbara Iron	Maintenance dredging of PP and EII and shipping channels	SD2009/1122	600,000	A/B
2007 - 2010	Woodside	Capital dredging for the Pluto LNG Development	SD2006/0033	14,100,000	A/B and 2B
2006 - 2007	Pilbara Iron	Capital and maintenance dredging for PP berths	SD2006/0036 and SD2005/0031	~3,000,000	East Lewis Island and A/B
2005 - 2006	Woodside	Capital dredging for the LNG Phase V Development	-	3,300,000	A/B

Date	Proponent*	Dredging program	SDP Number (if known)+	Dredge Material Volume (m^3)	Spoil Ground
2004	Hamersley Iron	Capital dredging for PP berths and maintenance dredging of the shipping channel	-	1,830,000 (capital) 70,000 (maintenance)	East Lewis Island and A/B
2004	DPA	Capital dredging for the Bulk Liquid Berth Facility	DPA 2003/1 and 2003/2	4,609,000	A/B
2003	Woodside	Capital dredging for the Trunkline Systems Expansion	N/A	1,060,000	A/B
1998	Hamersley Iron	Capital dredging for shipping channel and maintenance dredging around PP and EII berths	N/A	2,000,000 (capital) 800,000 (maintenance)	A/B
1994	Woodside	Capital dredging for the berth pocket for LNG ships	N/A	700,000	A/B
1989	Woodside	Maintenance dredging of the LNG shipping channel	N/A	149,700	A/B
1986 - 1987	Woodside	Capital dredging for the LNG shipping channel	N/A	6,600,000	A/B
1970 - 1971	Hamersley Iron	Capital dredging to widen main shipping channel and extend EII	N/A	760,000	East Lewis

Date	Proponent*	Dredging program	SDP Number (if known)+	Dredge Material Volume (m^3)	Spoil Ground
1968	Hamersley Iron	Capital dredging of main shipping channel	N/A	1,500,000	East Lewis
1965	Hamersley Iron	Capital dredging of main shipping channel and PP	N/A	2,500,000	East Lewis

*Hamersley Iron and Pilbara Iron are wholly owned companies of Rio Tinto Limited (Rio Tinto) within the Rio Tinto Iron Ore product group. Pilbara Ports Authority (previously Dampier Port Authority) is now Pilbara Ports.

+ permits issued prior to 2004 did not have a permit number. Dashed line indicates permit number is not known.

2.4 Existing Sediment Chemistry Information

Testing of sediments for previous dredging programs within the Port of Dampier has been undertaken on many occasions by a range of proponents. Table 2-2 details the previous sediment testing campaigns over the past 20 years and includes any noteworthy contaminants detected in which the upper 95th percent confidence limit (95% UCL) of the mean exceeded screening levels.

On the basis of past investigations of sediment chemistry from the Port of Dampier, the contaminants of concern depend mainly on the sediment type and the proximity to existing berths, load out facilities and shipping routes. This is summarised below:

- Organotins i.e. tributyltin (TBT) and some metals above screening guidelines have been found primarily within or around existing berth-load out areas, but organotin levels have reduced significantly since being banned on large vessels;
- The distribution of contaminants has been confined largely to the fine sediments in the upper strata (0.5 m);
- The detection of contaminants has been more likely to occur in the sediments of high vessel traffic areas, berths, loading facilities and previously dredged areas such as channels that accumulate sediments;
- Consolidated sediments underlying upper soft strata have not been found to contain contaminants above screening levels;
- Naturally occurring high levels of arsenic and nickel are present within the Port of Dampier, Dampier Archipelago and the Pilbara region, but are typically found in sediments with a high proportion of fine particles and are of low bioavailability (Stoddart et al. 2019);
- The presence of petroleum hydrocarbons has usually been low. The only exception being polycyclic aromatic hydrocarbons (PAHs) found around existing berth-load out areas during a study conducted by SKM (2009). Recent testing in the area found no trace of petroleum hydrocarbons (GHD 2016a; Jacobs 2015a; MScience 2015); and
- All surveys conducted have confirmed that the sediment quality meet the applicable guidelines for safe ocean disposal at that time.

Table 2-2. Dampier sediment characterisation history

Project (Reference)	Proponent	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal[#]
		TBT*	Metals	Organics	
Maintenance Dredging (O2 Marine 2025)	Pilbara Iron	-	Nickel above screening level (21 mg/kg) in berth/swing basin (24.65 mg/kg) and shipping channel (22.95 mg/kg) areas. However, after normalisation for grain size, nickel concentrations met the screening assessment value derived from comparison with the 80th percentile of the background at the spoil grounds.	-	Yes
Maintenance Dredging (O2 Marine 2024)	Pilbara Ports	-	-	-	Yes
Dampier Marine Environmental Quality Monitoring Program 2021/2022 (O2 Marine 2023)	PPA	-	Some metals above EQGs assigned by the program: - Iron (29,920 mg/kg) at TDPL (44,000 mg/kg) and EII (47,000 mg/kg) - Arsenic (20 mg/kg) at ICI (30 mg/kg)	-	N/A
Dampier Cargo Wharf Extension (MScience 2022)	PPA	-	-	-	Yes
Dampier Marine Environmental Quality Monitoring Program 2020/2021 (O2 Marine 2021)	PPA	-	Some metals above EQGs assigned by the program: - Iron (29,920 mg/kg) at ICI (45,000 mg/kg) and TDPL (46,000 mg/kg) - Copper (5.41 mg/kg) at ANGL, MALI and WLIS (all sites at 14 mg/kg)	-	N/A

Project (Reference)	Proponent	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal[#]
		TBT*	Metals	Organics	
Maintenance Dredging (MScience 2020)	Pilbara Iron	-	Nickel above screening level (21 mg/kg) in channel (21.3 mg/kg) and berth/swing basin (28.2 mg/kg) areas. However, after normalisation for grain size, nickel concentrations met the screening assessment value derived from comparison with the 80th percentile of the background at the spoil grounds.	-	Yes
Dampier Marine Environmental Quality Monitoring Program 2019/2020 (O2 Marine 2020)	PPA	-	Some metals above EQGs assigned by the program: - Arsenic (10 mg/kg) at WLIS (17 mg/kg) - Mercury (0.01 mg/kg) at WLIS (0.02 mg/kg) - Iron (29,920 mg/kg) at TDPL (37,000 mg/kg) and EII (34,000 mg/kg)	-	N/A
Maintenance Dredging (Advisian 2019)	PPA	-	Nickel above screening level (21 mg/kg)	-	Yes
Sediment Assessment (GHD 2016a)	PPA	-	Nickel above screening level (21 mg/kg) at SP1 (EII departure channel) (27.2 mg/kg) Arsenic above screening level (20 mg/kg) at: - SP4 (General Port) (25.8 mg/kg) - SP16 (General Port) (29.3 mg/kg)	-	N/A
Sediment Assessment (Jacobs 2015a)	PPA	Above screening level (0.5 µg Sn/kg) at site: - 2A (king bay) (1 µg Sn/kg) - 6A (EII) (0.7 µg Sn/kg)	Nickel above screening level (21 mg/kg) at: - 3A (Spoil Ground A/B) (22.4 mg/kg) - 5A (EII) (26.2 mg/kg) - 6A (EII) (28 mg/kg) - 9A (General Port) (24.7 mg/kg) - 11A (EII) (24.2 mg/kg)	-	N/A

Project (Reference)	Proponent	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal[#]
		TBT*	Metals	Organics	
Maintenance Dredging (MScience 2015)	Pilbara Iron	-	Chromium above screening levels (80 mg/kg) at EII berths (94.3 mg/kg) Nickel above screening levels (21 mg/kg) at: - EII berths (39.7 mg/kg) - PP berths (23.7 mg/kg)	-	Yes
Heavy Load Out Facility (Worley Parsons 2012)	DPA	-	-	-	Yes
Heavy Load Out Facility (ERM 2011)	Chevron	-	-	-	Yes
Pluto Train 3 Expansion (MScience 2010a)	Woodside	-	Arsenic detected at 25.24 mg/kg in the Nearshore Outer trunkline zone (above screening level of 20 mg/kg)	-	Yes
Dampier Marine Service Facility Upgrade (Worley Parsons 2009)	DPA	-	-	-	Yes
Maintenance Dredging (SKM 2009)	Pilbara Iron	Above screening levels (5 µg Sn/kg) in PP departure channel (8.8 µg Sn/kg) and uppermost (50 cm) of EII sediments (26.9 µg Sn/kg). Above maximum level (70	Chromium above screening levels (80 mg/kg) at: - PP (97 mg/kg) - PP departure channel (94 mg/kg) - EII (167.7 mg/kg) - EII departure channel (86 mg/kg) - Reference site (80.3 mg/kg)	Total PAH above screening level (4,000 µg/kg) at EII	Yes

Project (Reference)	Proponent	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal[#]
		TBT*	Metals	Organics	
		µg Sn/kg) in 50-100 cm of EII sediments (11,617 µg Sn/kg)	Nickel detected above screening levels (21 mg/kg) at: - PP (34 mg/kg) - PP departure channel (37 mg/kg) - EII departure channel (35.3 mg/kg) - Main channel (30 mg/kg) - Reference site (27 mg/kg) Nickel above maximum level (52 mg/kg) at EII (60 mg/kg) Copper above maximum level (270 mg/kg) at EII (837 mg/kg) Zinc above screening level (200 mg/kg) at EII (257 mg/kg)		
Spoil Ground 2B (SKM 2008)	Rio Tinto	-	-	-	N/A
Dampier Cargo Wharf Capital Dredging (MScience 2007a)	DPA	Above screening level (5 µg Sn/kg) within DCW eastern face berth	-	-	Yes
Pluto LNG Development (SKM 2006)	Woodside	-	Some arsenic, chromium, nickel and silver samples above guidelines, however, 95% UCL for all metals were below guidelines	-	Yes
Dampier Port Upgrade	Pilbara Iron	Above screening level (5 µg Sn/kg) at:	Nickel samples above screening levels (21 mg/kg) at East Lewis Spoil Ground (26.5 mg/kg)	-	Yes

Project (Reference)	Proponent	Noteworthy Contaminants Detected in which the 95%UCL of the Mean Exceeded Screening Levels (dashes indicate 95%UCL below screening guideline)			Safe for Ocean Disposal#
		TBT*	Metals	Organics	
(MScience 2006)		- PP (185 µg Sn/kg) - EII (96 µg Sn/kg) - Area E-P (32 – 62 µg Sn/kg)			
Contaminant assessment in selected Pilbara marine coastal sediments (DoE 2006)	DoE (WA)	-	Arsenic above screening level in inner harbour	-	N/A
Bulk Liquids Berths Dredging Spoil Ground A/B pre- and post- dumping TBT assessment (MScience 2004a; MScience 2004b)	DPA	-	-	-	N/A
Dampier Port Upgrade – Parker Point Extension (MScience 2004c)	Hamersley Iron	-	Elevated levels of aluminium and iron, remaining metals below screening levels	-	Yes

*TBT screening levels increased from 5 µg/kg to 9 µg/kg when NODGDM was superseded by the NAGD (Commonwealth of Australia 2009) in early 2009

N/A - not applicable since survey was designed for sediment characterisation only and/or the project did not seek an application for ocean disposal

3 MAINTENANCE DREDGING AND SEA DISPOSAL REQUIREMENTS

3.1 Dredge and Disposal Locations

3.1.1 Dredging Areas

During the period of the current SDP, dredging campaigns may occur in some or all of the area depicted in Figure 3-1 These areas include the berths, swing basins and departure channels associated with the Proponent's PP and EII facilities.

Characteristics of the Proponent's proposed maintenance dredge areas are detailed in Section 3.4 and 4 of this LTMMP.

3.1.2 Disposal Areas

The Port of Dampier currently utilises three spoil grounds which can be considered for disposal based on characteristics of specific dredging programs. These spoil grounds are named East Lewis Island Spoil Ground, Spoil Ground A/B and Spoil Ground 2B (Figure 1-1).

The East Lewis Island Spoil Ground was used as a spoil ground for much of the original dredging of the Proponent's port infrastructure (DPA 2010). Spoil Ground A/B was established in 1986 to accommodate spoil from Woodside's LNG shipping channel capital dredging program. Spoil Ground 2B was established for Woodside's Pluto LNG Development and first used for spoil disposal in 2007.

The current Pilbara Ports long term dredge management plan for the Port of Dampier (GHD 2021) indicates that the East Lewis Island Spoil Ground and Spoil Ground A/B are no longer used for disposal of large capital dredging programs. These spoil grounds do have capacity to store volumes of dredge material from smaller dredging programs (such as maintenance dredging), especially where dredging plant (such as hopper barges) cannot safely use the offshore grounds. Material from larger capital dredging programs is to be placed at Spoil Ground 2B.

The capacity within Spoil Ground A/B is also retained for future emergency dredging campaigns. This ground is suitable for this use due to its proximity to Port infrastructure, facilitating short cycle times and rapid clearance.

Spoil disposal under the present proposal is proposed to occur at Spoil Ground A/B or Spoil Ground 2B, as shown in Figure 3-2 (see Table 3-1 for spoil ground coordinates). All spoil disposal is subject to prior agreement from Pilbara Ports and following consultation with the Dampier TACC. The East Lewis Island Spoil Ground has not been considered for use as a spoil disposal site under the current LTMMP/SDP application. Characteristics of the disposal sites are detailed in Section 3.4 and 4 of this LTMMP.

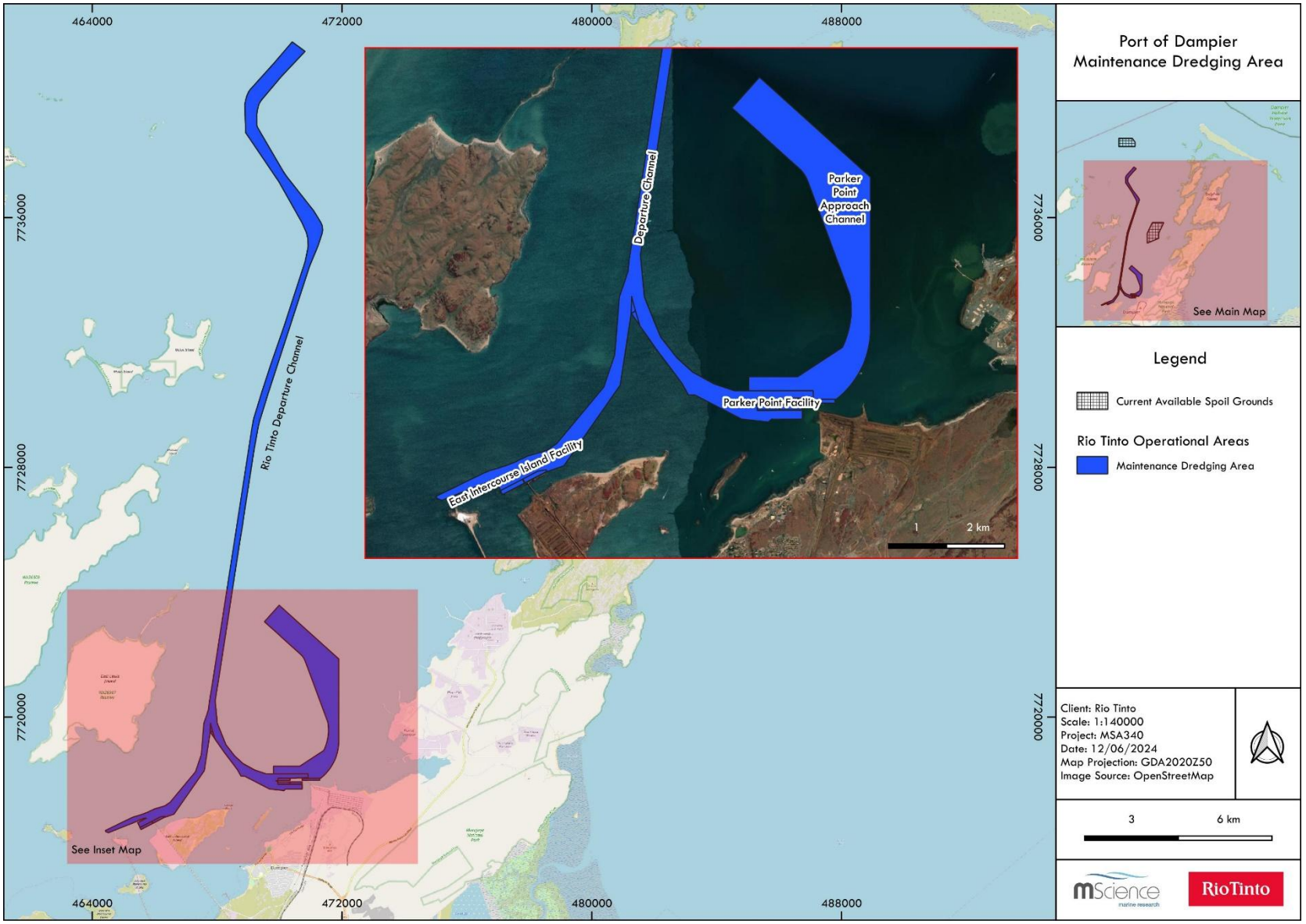

Figure 3-1. Maintenance dredge area

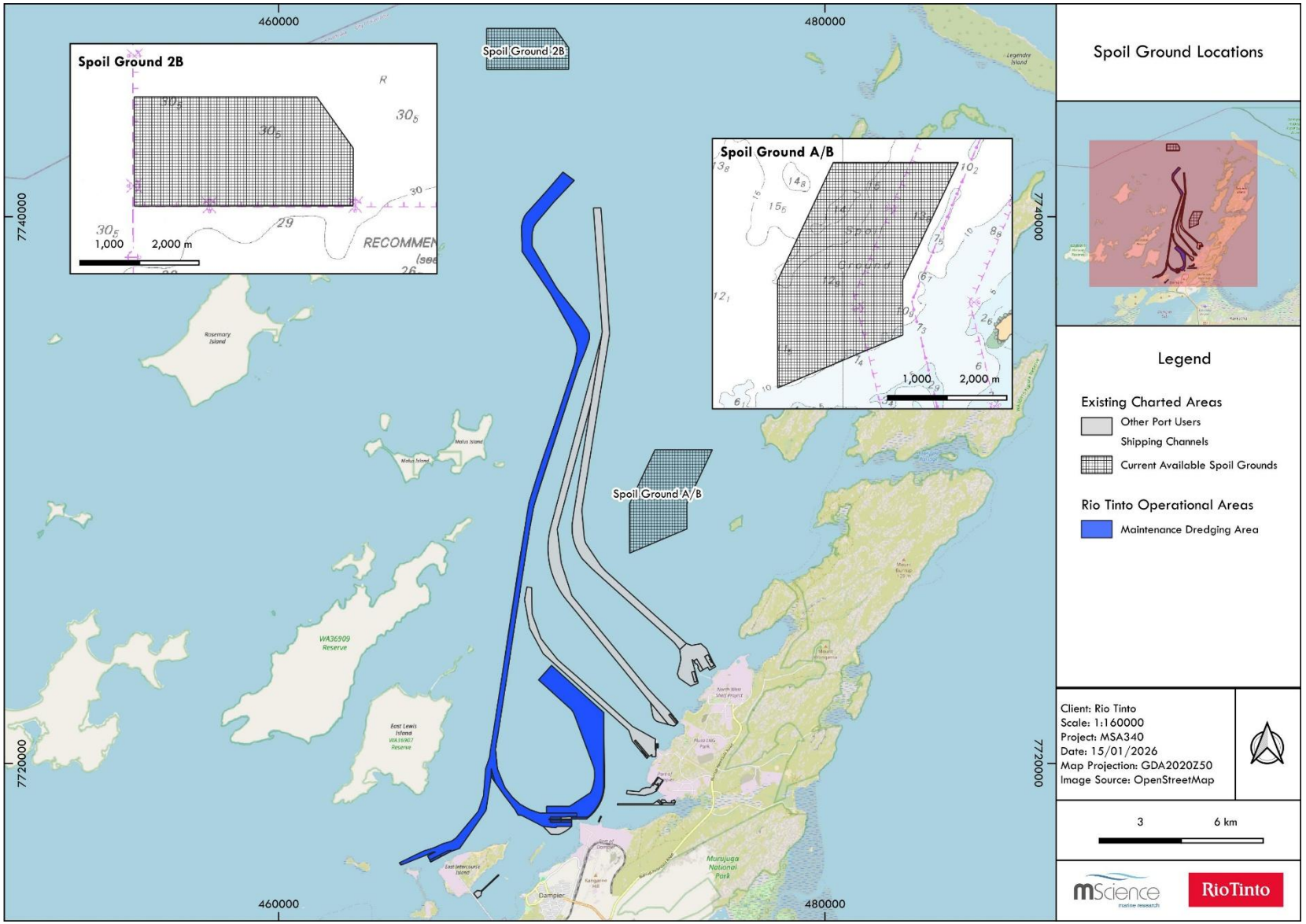

Figure 3-2. Spoil ground locations

Table 3-1. Spoil ground coordinates

Spoil Ground	Longitude	Latitude
Spoil Ground A/B (Site code AU0088A)	116° 44' 53.880" E	20° 30' 54.720" S
	116° 46' 6.240" E	20° 30' 54.720" S
	116° 45' 34.560" E	20° 31' 59.880" S
	116° 44' 21.480" E	20° 31' 59.880" S
	116° 45' 34.389" E	20° 32' 29.433" S
	116° 44' 22.055" E	20° 32' 57.766" S
Spoil Ground 2B (Site code AU0088B)	116° 41' 22.795" E	20° 22' 33.343" S
	116° 42' 49.038" E	20° 22' 33.491" S
	116° 43' 6.245" E	20° 22' 56.290" S
	116° 43' 6.198" E	20° 23' 22.314" S
	116° 41' 22.697" E	20° 23' 22.138" S

3.2 Dredge Volume

It is anticipated that up to 630,000 m^3 of dredge material may require disposal over the life of the LTMMP/SDP (ten years). This volume has been calculated based on the following:

- an annual disposal volume of approximately 45,000 m^3 during years with limited cyclonic activity (it has been assumed seven years out of the ten-year life of the permit will have limited cyclonic activity).
- an annual disposal volume of up to approximately 105,000 m^3 during years in which the accumulation rate of sediments in dredged areas has been increased by cyclonic activity.

These volumes have been estimated using current siltation rate modelling (Wavelength 2024), best available survey information and historic accumulation rates, and the requirement for maintenance dredging due to a significant weather event (refer to Section 3.2.1).

Maintenance dredging may be conducted as frequently as annually. Actual dredged volumes per campaign will vary, depending on the amount of accumulated material within the proposed dredge areas. The actual volumes will be determined from pre and post dredge surveys, but the combination of all dredge campaigns will not exceed the total volume sought in the SDP application.

3.2.1 Contingency Dredging

The Pilbara coast experiences more cyclones than any other part of Australia (BOM 2024). The tropical cyclone season extends between 01 November and 30 April, with a peak in February and March.

The Port of Dampier has historically experienced varying degrees of infill of berth pockets and channel areas as a result of sediment movement caused by cyclonic events. Following high intensity cyclones, maintenance dredging and offshore disposal has been required to remove sediment from areas critical to the effective functioning of the ports.

It is anticipated that the permitted dredge volume of the SDP will cover all maintenance dredging requirements, regardless of origin or cause of accretion within the dredged areas (e.g. whether it arises from a gradual accretion or a more rapid deposition arising from cyclonic event/s).

3.2.2 Planned Capital Dredging

There are no current plans by the Proponent for capital dredging programs within the proposed ten-year SDP period. In addition, there are no known capital dredging programs being proposed by other port users. Should another port user (or new port user) propose to undertake a capital dredging program within the life of the LTMMP, the LTMMP would be reviewed to consider management of any cumulative effects.

3.3 Dredge Campaign Methodology

3.3.1 Dredging

Maintenance dredging may be conducted annually over the period of the SDP (ten years, starting 2026), and may occur in some or all of the area described in Section 3.1.1. Maintenance dredging campaigns are likely to use either a medium or large Trailer Suction Hopper Dredge (TSHD). In addition, a back-hoe dredge (BHD) may be used in shallow or confined areas close to infrastructure.

A TSHD is a self-propelled vessel equipped with one or two drag arms (each with an attached drag head), powerful pumps and a hopper to store the dredged material. The drag arms are lowered so the drag heads can be trailed across the seabed where material is to be dredged. Suction induced by the dredge pumps generates a strong flow field about the drag head intakes. This flow field entrains particles of bed material. A solids-water mixture is formed, drawn in through the drag heads, up suction pipes in the drag arms and is pumped into the hopper. The coarser-sized solids deposit more rapidly inside the hopper to form a material bed, while some finer-sized particles remain suspended in water overlying the hopper bed. As dredging continues the surface level of the water in the hopper rises till it reaches the (adjustable) level of a weir. Excess water then leaves the hopper by overflowing the weir and is conveyed through an overflow pipe to a discharge point at the base of the vessel. The overflow discharge carries with it suspended solids (predominantly finer, more slowly settling fractions of the dredged material) that have not been retained in the hopper.

A BHD is a variety of mechanical dredger consisting of a hydraulic excavator mounted on a pontoon that operates a bucket to dig up the seabed. BHD's are anchored in position, and moved forward, by spud poles. Once removed from the seabed, material is discharged into a hopper barge.

3.3.2 Disposal

On completion of loading, the TSHD or hopper barge will sail to the nominated spoil ground where its contents are discharged by opening the doors or valves in the hopper bottom. Release of the dredged material will typically be managed so as to preferentially fill deeper sections of the disposal site, although vessel safety and navigational constraints will dictate the exact location of any individual dump. Rate and duration of discharge will depend on the dredging plant selected. Vessel speed during release will vary as a function of the water depth at the site and the type (gradation and cohesiveness) of material being released. Release of the dredged material will be managed to ensure that the spoil ground is filled in an organised and consistent manner. Once empty, the dredge/barge returns to the dredge area where the cycle is repeated. The position of the dredge/barge will at all times be controlled by a vessel positioning system, which will allow the actual track of the vessel to be plotted and the location of individual dump operations to be recorded.

The duration of each disposal event (including positioning and hopper rinsing) may be up to 30 minutes, however, the active disposal phase (when the majority of material is discharged through the bottom doors) is typically less than 10 minutes. Effective closing of hopper doors to prevent loss of spoil will be checked each cycle.

3.4 Characteristics of Dredge and Disposal Sites

Proposed disposal sites are all existing approved spoil disposal grounds, used previously, as described in Section 3.1.2. The dredge area is shown in Figure 3-1 (refer Section 3.1.1). The following sections discuss their sediment characteristics. Additional physical and chemical environmental characteristics of the dredge and disposal sites are detailed in Section 4.

3.4.1 Physical Sediment Characteristics

3.4.1.1 DISPOSAL SITE

The following sediment characteristics of the spoil grounds have been inferred from samples collected around the spoil grounds during a recent survey of the area (O2 Marine 2025). The survey identified sediments from sites around Spoil Ground A/B to be largely comprised of sand (~60 % at 62 - 2000 µm), with the next largest fractions being the fines, clays and silts (~40% at <62 µm). No gravel fraction (2000 – 10000 µm)) was recorded from samples taken during the survey. There are minor differences between the spoil grounds, with Spoil Ground 2B showing more sands (~73 %) and less silt/clay (~26 %) than Spoil Ground A/B.

3.4.1.2 DREDGE SITE

Most of the material to be dredged is comprised of unconsolidated marine sediments (calcareous sand, silt, clay and gravel shells) and coastal limestone (accreted calcarenite, siliceous calcarenite and calcirudite); however, some material close to shore may include broken down dolerite and granite. It is estimated that the surface marine sediments are up to 5 m thick and the coastal limestone extends below -14.5 m (chart datum). The particle size distribution of material to be dredged has been derived from samples collected by O2 Marine (2025). In general, material in the channel is approximately 30% fines (<62 µm) and 65% sand (62 – 500 µm) with small amounts of coarser material (~5%), while closer to shore (in berths and swing basins) there is slightly more fines (60%) and less sand (20 - 35%) with the remainder comprised of coarse material.

3.4.2 Chemical Sediment Characteristics

The most recent analyses of sediment samples taken from the immediate surrounds of Spoil Ground A/B and Spoil Ground 2B returned levels below NAGD screening levels for metal and organic contaminant (i.e. TBT and hydrocarbons) concentrations (MScience 2020; O2 Marine 2025).

Previous analyses of sediment samples taken from within the bounds of Spoil Ground A/B have returned levels below NAGD screening levels for metal concentrations (GHD 2016b). However, samples taken from the outer edge and immediate surrounds of the same disposal site have recorded elevated levels of arsenic (25.8 mg/kg) and nickel (22.4 mg/kg) (GHD 2016b; Jacobs 2015b). Similarly, samples taken from within the bounds of Spoil Ground 2B have returned levels below NAGD screening levels, but samples taken from the outer edge of its southwest corner of that disposal site have recorded elevated levels of arsenic (29.3 mg/kg) (GHD 2016b; Jacobs 2015b), suggesting that some areas may be subject to high levels of naturally occurring arsenic.

No recent survey has found detectable levels of organotins (such as TBT) or hydrocarbons within samples taken from within or around the spoil grounds (GHD 2016b; Jacobs 2015b; MScience 2020; O2 Marine 2025).

The most recent chemical characterisation of sediment within the areas to be dredged occurred in 2024 (O2 Marine 2025). The survey by O2 Marine (2025) found all metals, other than nickel, to be below screening levels. However, the occurrence of high concentrations of nickel at inshore sites in the Port of Dampier and throughout the Pilbara is known to be widespread and naturally occurring (Stoddart et al. 2019).

TBT and hydrocarbon levels in sediments within the areas to be dredged were found to be below screening guidelines (O2 Marine 2025).

3.4.3 Spoil Ground Capacity and Sediment Flux

The most recent sediment stability study of Spoil Ground A/B and Spoil Ground 2B shows that under ambient conditions sediment mobility within the spoil grounds is low, and would quickly return to low levels following a cyclonic event (RPS APASA 2016). In all instances the loss of material is greater at Spoil Ground 2B when compared to Spoil Ground A/B (RPS APASA 2016). No dredging-related impacts were recorded at sensitive coral habitats nearest to Spoil Ground A/B during the intensively monitored three year Pluto dredging/disposal program which used Spoil Ground A/B for part of its spoil disposal, despite the occurrence of several major cyclones over that period (MScience 2010b).

A study of sediment grain sizes on Spoil Ground 2B suggested that little of the very fine component of sediment dumped on this spoil ground during the Pluto LNG Development remained in the surface sediments (MScience 2008). The same study also showed a gradient of particle size and chemical composition for sediments between this spoil ground and Hamersley Shoal (nearest sensitive benthic habitat), although sediments at Hamersley Shoal itself were not altered in response to spoil. This suggests that while Spoil Ground 2B is dispersive for fine sediments, dispersion of these sediments is not likely to impact surrounding habitats. Surveys to date suggest Spoil Ground A/B is largely retentive (RPS APASA 2016).

Table 3-2 provides an indication of the theoretical capacity remaining at these spoil grounds provided by the current Pilbara Ports long term dredge management plan for the Port of Dampier (GHD 2021). Use of Spoil Ground A/B under the current dredging program will be subject to prior agreement from Pilbara Ports and following consultation with the Dampier TACC.

Table 3-2. Remaining capacity of established spoil grounds

Spoil Ground	Celling Depth (m CD)*	Area (ha)	Remaining Capacity (Mm^3)+
Spoil Ground A/B	-10.5	705	6.7
Spoil Ground 2B	-23.5	432	38.5

* Nominated ceilings have been historically set by Pilbara Ports (in consultation with the Dampier TACC) based on limits set for safe navigation (for transit over the spoil grounds) and sediment dispersion modelling / assessments.

+ Capacities derived from calculations undertaken by Pilbara Ports using hydrographic survey data available for each spoil ground at the time of developing this LTMMP.

3.5 Sediment Sampling and Analysis Plan

In order to update the currency of valid sediment data for the SDP application and to ensure that spoil would be suitable for ocean disposal in accordance with the NAGD, a SAP was developed and implemented in November 2024. The results of the implemented SAP have been summarised in Section 3.4.2 The SAP implementation report and this LTMMP form part of the SDP application.

A further SAP will be implemented before November 2029, and report submitted, in order to maintain currency of valid data over the duration of the LTMMP/SDP and to ensure that spoil remains suitable for ocean disposal in accordance with the NAGD.

4 EXISITING ENVIRONMENT

4.1 Metocean Conditions

4.1.1 Climate

Air temperatures along the Pilbara coast vary from mean maximum temperatures in the mid to high twenties during the cooler months (May to August) and low to mid thirties (centigrade, ^{o}C) during the warmer months (September to April) (BOM 2022). Records show March to have the highest mean maximum temperature of 34.8^{o}C, with July the lowest mean maximum of 25.8^{o}C (BOM 2022). On average, over two hundred days per annum exceed 30^{o}C, five of which exceed 40^{o}C. January has the highest mean minimum temperature of 26.6^{o}C with July further recording the lowest mean minimum temperature of 17.3^{o}C.

Monthly and annual rainfall is highly variable with the majority of rain falling during the warmer months as a result of tropical low pressure systems. Mean annual rainfall for the Port of Dampier is 303.9 mm with highest mean rain falling in February 97.1 mm, and lowest mean rainfall in November 0.1 mm (BOM 2022).

4.1.2 Winds

Prevailing winds are west to south westerly during the warmer months (September to April) and easterly during the cooler months (May to August). During the warmer months wind strength tends to increase throughout the day and are strongest in the afternoons, whilst the opposite occurs in the cooler months (BOM 2022). The south westerly winds average between 15 and 20 knots and easterly winds typically between 20 and 25 knots.

Tropical cyclones generally occur between November and April in the Pilbara. Winds in excess of 250 km/hr, torrential rain, storm surges, large waves and substantial movement of coastal sediments can be experienced during cyclones.

4.1.3 Wave Climate

Typically, swell and waves approach the Pilbara coast from the north and north-west as a result of Southern Ocean swell refracted by the regional bathymetry and islands of the North West Shelf (Semeniuk 1996). The Port of Dampier is protected to the west and east by the islands of the Dampier Archipelago and south by mainland Australia. As a result, these islands reduce swell and wave height by up to 50% as they propagate down Mermaid Sound towards the inner Port region (Pearce et al. 2003).

Swells tend to be greatest in winter (June/July, typically 2 m in height) and smallest in summer (~1 m in height) (Pearce et al. 2003). Swells generated offshore during storms and cyclones can reach heights of more than 5 m, with a theoretical height of 20 m.

4.1.4 Tides

The tidal regime of the area is semi-diurnal with a slight diurnal inequality (difference in height between the two highs or two lows) (Pearce et al. 2003). The Port of Dampier experiences mean high water springs tides of 4.5 m and mean low water spring tides of 0.8 m approximately two days after the full and new moon; however, Highest Astronomical Tides (HAT) can be much higher (up to 5.1 m) (Pearce et al. 2003).

4.1.5 Currents

Water circulation and currents in the Dampier Archipelago are determined by a combination of large scale ocean circulation, tides, local winds (including tropical cyclones) and non-tidal long period waves (continental shelf waves and meteorological effects) (Pearce et al. 2003). Close to the coast, flows are mainly parallel to the shore with speeds ranging from about 5 cm/s (neap tides) to 25 cm/s (spring tides). The magnitude of currents in the Archipelago are firstly influenced by localised bathymetry and secondly by the location

of islands (Pearce et al. 2003). Consequently, strong currents flow along the axis of Mermaid Sound and in the channels between the islands due to the narrow passages and the shallow bathymetry.

Tidal currents in these shallower areas can be strong during spring tides (Pearce et al. 2003), causing re-suspension and mixing of sediments. Re-suspension in shallow areas may also occur as a result of wind waves generated within the Archipelago, vessel propeller wash and tropical cyclone or rainfall events (Stoddart and Anstee 2005). As a result, where there is accumulation of contaminants of concern, these near-shore areas may lose fine sediments to the deeper basins in the middle of the Port of Dampier. Conversely, the much lower specific gravity of contaminants such as petroleum hydrocarbons would mean they are more likely to be washed ashore on the surface of the water and accumulate in near-shore zones following a spill or leak.

4.1.6 Water Quality

Waters of the North West Shelf are usually temperature-stratified, with sea surface temperatures (SST) attaining a mean temperature of 29.3°C in March, dropping to 24°C in August (Pearce et al. 2003). Nearshore, in the semi-enclosed waters of the Port of Dampier, temperature means vary from 21-23°C in July/August to 30-31°C in February/March (O2 Marine 2022; Stoddart and Anstee 2005).

Salinity remains relatively constant temporally (~35.5 ppt) (O2 Marine 2022), however it can vary spatially. Within the Dampier Archipelago, surface salinity decreases from high inshore salinities (about 36.7 ppt) to lower salinities further offshore (about 35.5 ppt). Mermaid Sound displays a 'winter hydrographic regime' whereby denser (cooler and more saline) water forms within the Archipelago, and wedges seaward beneath open North West Shelf waters. During summer, a 'summer hydrographic regime' is characterised by vertical stratification on the open continental shelf and elevated salinity in shallower coastal waters (Pearce et al. 2003). Heavy rainfall from cyclones may significantly reduce surface salinity at times (Stoddart and Anstee 2005).

Nutrient concentrations from the nearshore waters of the Dampier Archipelago, such as those within the Port of Dampier are considered oligotrophic. High spatial and seasonal variability are evident in nutrient and chlorophyll-a concentrations (O2 Marine 2022; Pearce et al. 2003). During the warmer months, blooms of nitrogen-fixing microbes such as *Trichodesmium* or mangrove mud-flat cyanobacteria are known to occur and may contribute significantly to the nutrient budget, however there have been no known deleterious water quality impacts caused by toxic algal blooms in the region (Heyward et al. 2000).

Coastal waters of the North West Shelf are generally very high quality, the concentration of metals are low by world standards. Localised elevations of some metals have been reported adjacent to the industrial centres and port operations of Dampier (MScience 2005a; O2 Marine 2022; Wenziker et al. 2006).

4.1.6.1 TURBIDITY AND TSS

Water quality investigations have been undertaken throughout the Dampier Archipelago, often as part of compliance monitoring in association with dredging and construction activities. More recently Pilbara Ports has collected water quality data as part of its marine environmental quality management program.

The deeper, offshore, waters of the North West Shelf are characterised by a relatively clear water column. Conversely, nearshore waters of the North West Shelf and waters of the inner Dampier Archipelago experience naturally higher levels of turbidity as a result of shallow bathymetry, tropical cyclone events and local re-suspension of fine sediments caused by wind and tidal mixing (Stoddart and Anstee 2005).

Past studies of water quality within the Port of Dampier have typically addressed turbidity, with suspended sediment concentration measured only occasionally. While there will be a relationship between these parameters, that will vary dependent on the particle size distribution of suspended sediment, the optical properties of sediments, the water depth and spectral properties of light reaching the sediments.

Studies have shown that local variation in exposure to tidal, wind and wave conditions may cause areas of the Dampier Archipelago to react differently from adjacent areas within a kilometre away. The most comprehensive continuous study of turbidity for this area established 33 sites to monitor turbidity between November 2007 and August 2010 for the Pluto dredging project (MScience 2010b). The mean turbidity, outside of dredging periods, at all sites ranged from 0.4 to 3.6 NTU over the 30 month study. Comparison of turbidity during dredging and non-dredging periods indicated that dredging appeared to increase mean turbidity by <0.5 NTU. Maintenance dredge monitoring at three sensitive coral sites around Spoil Ground A/B found mean turbidity readings ranged from 1.4 to 1.9 NTU between the 29 September and 16 November 2016 (MScience 2016). The study showed the background level of turbidity was highly site and weather dependent with consistent differences between sites. Quarterly monitoring of turbidity within the Port of Dampier between 2019 and 2021 for Pilbara Ports marine environmental quality management program showed mean turbidity values between 0.8 and 2.3 NTU (O2 Marine 2022).

4.2 Marine Habitats

The subtidal substrates around Dampier generally consist of soft silt/sand sediments of terrestrial origin with occasional limestone rocky reef (Stoddart and Anstee 2005). The fringing and subtidal reef systems provide habitat for a range of species including diverse coral, fish and invertebrate communities mixed with macroalgae. The composition of key benthic communities and habitats (BCH) within the Dampier Archipelago has been well documented by a variety of studies over the last 20 years and a habitat map detailing the distribution of BCH, using spatial data from those studies, has been produced previously (MScience 2018) (Figure 4-1).

The following sections detail the marine environments of the Dampier Archipelago as described in Semeniuk *et al.* (1982) and Wells and Walker (2003). The following information is based on those references, unless cited otherwise.

4.2.1 Rocky Shores

Rocky shores are the most conspicuous intertidal habitat within the Dampier Archipelago. The coastline is largely Precambrian igneous rock, but in some areas, there is an overlay of Pleistocene limestone. The fauna of the upper shores is sparse, dominated by littorinid snails and grapsid crabs. The intertidal region has a diverse fauna dominated by oysters and associated species such as limpets, chitons, crabs, and barnacles. The biota becomes increasingly diverse in the lower intertidal, with a variety of sessile and motile invertebrates and benthic algae. Corals reach into the lowest portions of the intertidal zone, and then dominate most subtidal rocks in areas of lower turbidity.

4.2.2 Sandy and Muddy Shores

Sedimentary shorelines dominate in the bays and inlets of the Pilbara coastline. There are few sandy beaches in the area. The exception is Hearson's Cove on the eastern Burrup Peninsula and a few coarse sand beaches and sand flats in the outer areas of the Dampier Archipelago. The sedimentary upper intertidal areas are dominated by extensive mudflats, which generally have mangroves. Seaward of the mangroves, the mudflats extend into subtidal areas. The seabed is mostly mud and fine sand. In many areas both the intertidal and subtidal areas have a rich and diverse benthos; however, the biota is impoverished in the vicinity of port infrastructure where there is a very fine mud on the bottom. Both seagrasses and algae are also relatively sparse in the intertidal, increasing in the shallow subtidal, but still reduced in biomass compared to temperate regions.

4.2.3 Mangroves

The geographical distribution of mangrove habitat is typically restricted to sheltered areas such as estuaries, tidal creeks and sheltered bays. Mangroves are recognised as being important habitats for feeding grounds

and fish nurseries, as well as protecting coastal areas from erosion by stabilising sediments. The Pilbara region supports a small number of mangrove species: *Avicennia marina*, *Aegialitis annulata*, *Aegiceras corniculatum*, *Bruguiera exaristata*, *Ceriops tagal*, and *Rhizophora stylosa*. *Avicennia marina* is the most abundant and ubiquitous of those species, occurring along some shores of Dampier and surrounding islands.

4.2.4 Coral Reefs

Coral reefs are widely distributed throughout the Dampier Archipelago. Those of the inner and mid zones of the Archipelago, particularly on the western side of the Burrup Peninsula within the Port of Dampier, are often limited to narrow bands adjacent to rocky shorelines. Although live coral cover can be reasonably high, the reefs themselves are generally a veneer of coral over rock rather than being of entirely biogenic origin.

More consistent and extensive areas of coral occur in the outer Archipelago, particularly at Hamersley Shoal, Legendre Island, the Malus Islands, Flying Foam Passage and the northern end of West Lewis Island. These reefs are up to several hundred metres wide and generally exhibit well-developed reef flats, reef crests and reef slopes. The deeper reef slopes of Hamersley Shoal and Legendre Island are dominated by soft corals (MScience 2007b).

Coral communities have also been recorded in the vicinity of King Bay. The majority of coral habitat identified within the Port of Dampier occurs in the immediate subtidal area; between approximately Spring Low Water and -4 m LAT (MScience 2005b). The majority of corals in the Archipelago occur at depths between 0-10 m (Jones 2004a). A total of 120 scleractinian coral species from 43 genera have been recorded in the Dampier Archipelago adjacent to the Port (Blakeway and Radford 2005).

4.2.5 Turf Algae, Macroalgae and Seagrass Communities

Nine species of seagrasses occur in the Dampier Archipelago; *Cymodocea angustata*, *Enhalus acoroides*, *Halophila decipiens*, *Halophila minor*, *Halophila ovalis*, *Halophila spinulosa*, *Halodule uninervis*, *Syringodium isoetifolium*, *Thalassia hemprichii*. These seagrasses tend to have reduced biomass compared to the dense seagrass meadows found in southern Western Australia (Wells and Walker 2003). *Halophila sp*. have been observed in small patches at Tidepole Island and covering large expanses of seabed throughout the offshore islands of Dampier (IRC Environment 2003). A survey of port waters found only *Halophila sp* which occurred ephemerally in small patches, with the largest distribution being in Withnell Bay (Bertolino 2006).

Subtidal limestone pavements within the Pilbara region are colonised by varying abundances of large communities of macroalgae including brown algae species *Sargassum sp*., *Dictyopteris sp*. and *Padina*, green algae species *Halimeda sp*. and *Caulerpa sp*. and red algal species of crustose corallines, non-corallines and algal turf (CALM 2005). Several of these species form thick canopies in summer which can compete with scleractinian corals (MScience 2010c).

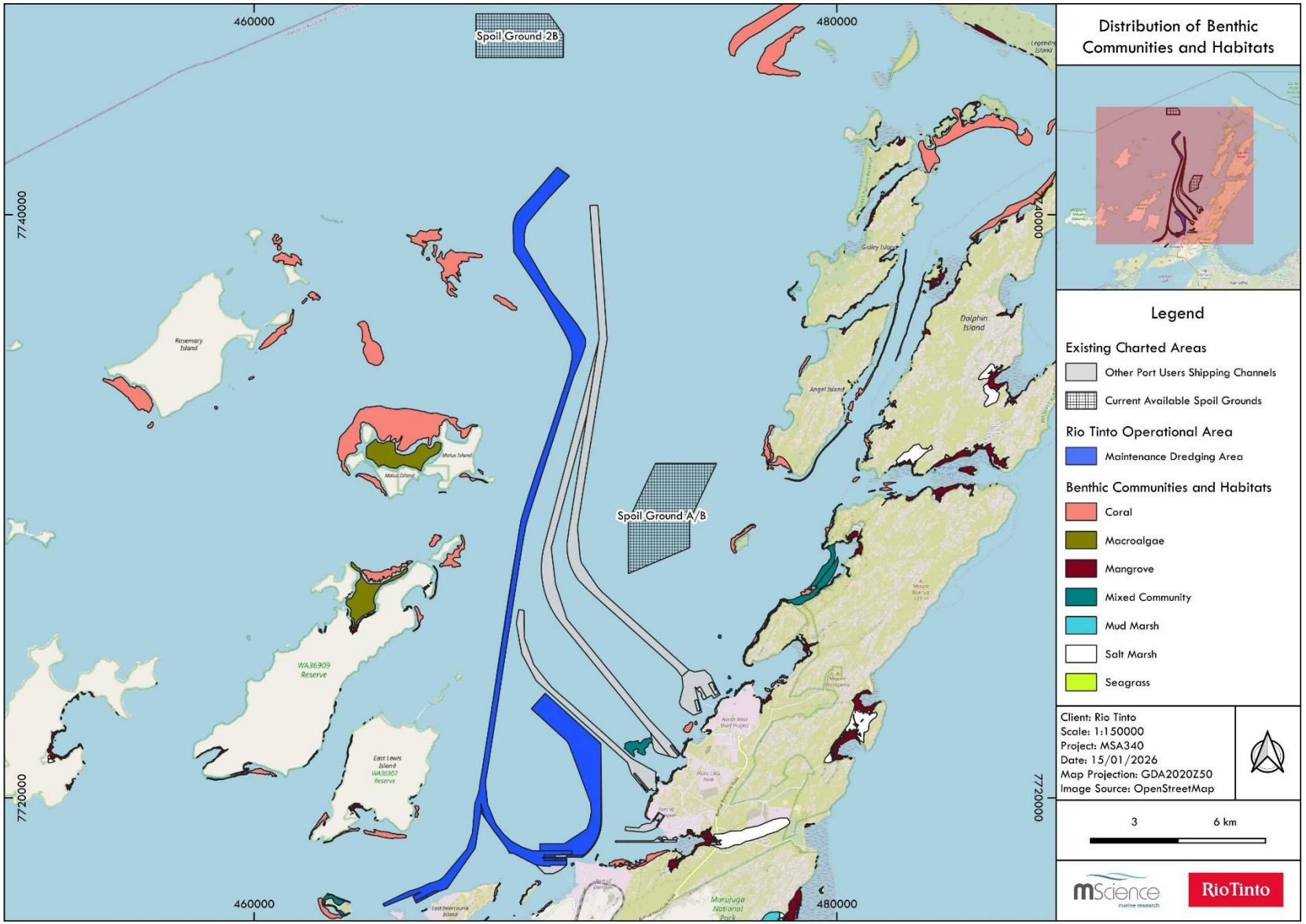

Figure 4-1. Distribution of key benthic communities and habitats in the Dampier Archipelago

4.3 Marine Fauna

The threatened and/or migratory species listed in Table 4-1 were considered to have a greater than 'possible' likelihood of being present within (1km) and/or adjacent (within 20km) to the proposed dredging footprint and spoil grounds, based on the Commonwealth Protected Matters Search Tool (PMST) report (Appendix B) and likelihood of occurrence assessment outlined in Appendix C. The assessment of impacts to marine fauna from dredging activities provided in this document has been limited to those listed in Table 4-1.

Table 4-1. Marine fauna with potential to occur within (1 km) or adjacent (20 km) to the dredging and disposal area

Species	**Likelihood of Occurrence**	
	1 km	**20 km**
Seabirds		
Australian Fairy Tern (*Sternula nereis nereis)*	U	AC
Wedge-tailed Shearwater (*Ardenna pacifica)*	P	AC
Caspian Tern (*Hydroprogne caspia)*	P	AC
Bridled Tern (*Onychoprion anaethetus)*	U	L
Roseate Tern (*Sterna dougallii)*	U	AC
Little Tern (*Stemula albifrons)*	P	P
Greater Crested Tern (*Thalasseus bergii)*	L	L
Shorebirds		
Red Knot (*Calidris canutus)*	L	L
Curlew Sandpiper (*Calidris ferruginea)*	L	L
Great Knot (*Calidris tenuirostris)*	U	L
Greater Sand Plover (*Charadrius leschenaultia)*	L	L
Lesser Sand Plover (*Charadrius mongolus)*	L	L
Far Eastern Curlew (*Numenius madagascariensis)*	L	L
Common Sandpiper (*Actitis hypoleucos)*	L	L
Marsh Sandpiper (*Tringa stagnatilis)*	U	P
Common Greenshank (*Tringa nebularia)*	L	L
Common Redshank (*Tringa tetanus)*	U	P
Pacific Golden Plover (*Pluvialis fulva)*	L	L
Osprey (*Pandion haliaetus)*	L	L
Grey-tailed Tattler (*Tringa brevipes)*	L	L

Species	Likelihood of Occurrence	
	1 km	20 km
Ruddy Turnstone (*Arenaria interpres)*	L	L
Sharp-tailed Sandpiper (*Calidris acuminata)*	L	L
Pectoral Sandpiper (*Calidris melanotos)*	U	P
Oriental Pratincole (*Glareola maldivarum)*	L	L
Broad-billed Sandpiper (*Limicola falcinellus)*	U	L
Asian Dowitcher (*Limnodromus semipalmatus)*	U	P
Black-tailed Godwit (*Limosa limosa)*	U	L
Red-necked Phalarope (*Phalaropus lobatus)*	U	P
Whimbrel (*Numenius phaeopus)*	L	L
Sanderling (*Calidris alba)*	U	L
Terek Sandpiper (*Xenus cinereus)*	U	P
Oriental Plover (*Charadrius veredus)*	U	P
Grey Plover (*Pluvialis squatarola)*	U	L
Red-necked Stint (*Calidris ruficollis)*	U	L
Long-toed Stint (*Calidris subminuta)*	U	L
Bar-tailed Godwit (*Limosa lapponica)*	L	L
Marine Mammals		
Humpback whale (*Megaptera novaeangliae)*	U	P
Killer whale (*Orcinus orca)*	U	P
Australian Humpback Dolphin (*Sousa sahulensis)*	P	L
Indian Ocean / Spotted Bottlenose Dolphin (*Tursiops aduncus)*	P	L
Australian Snubfin Dolphin (*Orcaella heinsohni)*	P	L
Dugong (*Dugong dugon)*	P	L
Marine Reptiles		
Short-nosed sea snake (*Aipysurus apraefrontalis)*	U	P
Leaf-scaled sea snake (*Aipysurus foliosquama)*	U	P
Loggerhead turtle (*Caretta caretta)*	P	L
Green turtle (*Chelonia mydas)*	L	AC
Leatherback turtle (*Dermochelys coriacea)*	U	P
Hawksbill turtle (*Eretmochelys imbricata)*	L	AC

Species	Likelihood of Occurrence	
	1 km	20 km
Flatback turtle (*Natator depressus)*	L	AC
Elasmobranchs and other fish		
Narrow sawfish (*Anoxypristis cuspidate*)	P	P
Green sawfish (*Pristis zijsron)*	P	L
Dwarf Sawfish (*Pristis clavate)*	P	P
Grey nurse shark (*Carcharias taurus)*	U	P
Scalloped hammerhead shark (*Sphyrna lewini)*	U	P
Giant manta ray (*Mobula birostris*)	U	P
Reef manta ray (*Mobula alfredi*)	P	L
Southern bluefin tuna (*Thunnus thynnus*)	U	P

The marine fauna listed in Table 4-1 have been discussed in the following sections.

4.3.1 Seabirds/Shorebirds

Four seabird species – the wedge-tailed shearwater, Caspian tern, roseate tern and Australian fairy tern – are known to breed on islands of the Dampier Archipelago (Table 4-2) (CALM 1990; Higgins and Davies 1996). The area has been recognised as a Biologically Important Area (BIA) for the roseate tern, Australian fairy tern and wedge-tailed shearwater (Parks Australia 2021).

Table 4-2. Seasonal presence of breeding seabirds in the Dampier Archipelago

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Australian Fairy Tern	Non-breeding presence							Breeding known				
Wedged-Tailed Shearwater	Breeding known									Breeding known		
Caspian Tern	Non-breeding presence						Breeding known					
Roseate Tern								Breeding known				

4.3.1.1 AUSTRALIAN FAIRY TERN

The population of Australian fairy terns is about 7,450 (range 6,800 – 8,100) mature individuals. The largest population of 5,000 – 6,000 in Western Australia is believed to be stable but there is no reliable historical data (Commonwealth of Australia 2020a).

The Australian fairy tern nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation (Higgins and Davies 1996). The species nest in clear view of the water and on sites where the substrate is sandy and the vegetation sparse. Colonies tend to occupy areas rather than specific sites, and nest sites are often abandoned after one year, regardless of success. However, if breeding fails at one area, the birds will often move to new locations to attempt re-laying within the same season (Higgins and

Davies 1996). During non-breeding, Australian fairy terns favour sheltered inshore waters and appear to be present around breeding sites throughout the year (Johnstone et al. 2013).

Quartermain Island is the closest island (~21 km) to PP/EII where the Australian fairy tern has been recorded to breed (CALM 1990).

The Australian fairy tern is listed as Vulnerable under both the EPBC Act and BC Act. Their conservation is managed under the National recovery plan for the Australian fairy tern (Commonwealth of Australia 2020a)

Although a BIA for breeding overlaps the Project development, no breeding colonies are located within 20 km. However, breeding and non-breeding individuals may pass through the area. The dredging and disposal areas offer no special feeding resource.

4.3.1.2 WEDGED-TAILED SHEARWATER

The global population of the wedge-tailed shearwater is estimated to number >5,200,000 individuals. Australia hosts a large proportion of the global population with approximately 1.1 million pairs breeding in Western Australia (Commonwealth of Australia 2020b). The species feeds mostly on fish, with some cephalopods and crustaceans. It catches prey mainly on the wing by dipping but also by surface-seizing or pursuit-plunging. Usually solitary or in small parties at sea, but often in large feeding flocks with other species (Commonwealth of Australia 2020b).

The wedge-tailed shearwater is a common breeding visitor to the Pilbara and has been recorded breeding on twelve islands in the Dampier Archipelago, the closest to PP/EII being Conzinc Island (~12 km from Parker Point), the Malus Islands (~14 km away), and Quartermain Island (at Elphick Nob, 21 km) (CALM 1990; Johnstone et al. 2013).

The wedge-tailed shearwater is listed as Migratory under the EPBC Act and BC Act. Australia has no adopted or made recovery plan for the species. However, the wedge-tailed shearwater is covered under the Australian wildlife conservation plan for seabirds (Commonwealth of Australia 2020b).

It is possible that during breeding, adults will forage in the waters adjacent to PP/EII, as indicated by the overlap of a BIA. However, due to low abundance of prey species, large numbers are not expected. Individuals may pass through the area enroute to more optimal foraging areas.

4.3.1.3 CASPIAN TERN

The global population of the Caspian tern is estimated to number between 250,000 – 470,000 individuals (Commonwealth of Australia 2020b). The species shows a preference for nesting on sandy, shell-strewn or shingle beaches, sand-dunes, flat rock-surfaces, sheltered reefs or islands with sparse vegetation and flat or gently sloping margins surrounded by clear, shallow, undisturbed waters (Higgins and Davies 1996). The Caspian tern nests in large colonies or as single pairs or small groups amidst colonies of other species. The species may forage up to 60 km from the site of the breeding colony (Commonwealth of Australia 2020b).

The diet of the Caspian tern consists predominantly of fish and minor amounts of the eggs and young of other birds, carrion, aquatic invertebrates (e.g. crayfish), flying insects and earthworms (Commonwealth of Australia 2020b).

The nearest breeding colony for Caspian terns is Conzinc Island, ~13 km north of PP/EII.

The Caspian tern is listed as Migratory under both the EPBC Act and BC Act. There is no adopted or made recovery plan for the species in Australia. However, the Caspian tern is covered under the Australian wildlife conservation plan for seabirds (Commonwealth of Australia 2020b).

Although nesting is expected to be absent directly adjacent to PP/EII, it is likely breeding and non-breeding individuals will be present, either passing through, roosting or foraging.

4.3.1.4 ROSEATE TERN

The Australian population of the roseate tern has been estimated to be at least 15,000 pairs, however, recent Australian population estimates and trends are unknown (Commonwealth of Australia 2020b). In WA, egg laying occurs between April and November, with hatching occurring about 25 days later (Higgins and Davies 1996). Following breeding, roseate terns are known to move away from breeding colonies but their non- breeding range is not well defined. They are usually associated with coral reefs and may also forage around islands on the continental shelf (Commonwealth of Australia 2020b). They are rarely recorded foraging in shallow sheltered inshore waters, usually only venturing into these areas when nesting islands are nearby (Higgins and Davies 1996). Therefore, roseate terns may forage within waters of the Dampier Archipelago but are expected to be less common than other tern species described above.

Roseate terns have been recorded breeding ~22 km from PP/EII, on Goodwyn Island, and are rarely recorded foraging in shallow sheltered inshore waters (Higgins and Davies 1996).

The roseate tern is listed as Migratory under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for the species. However, the roseate tern is covered under the Australian wildlife conservation plan for seabirds (Commonwealth of Australia 2020b).

Although a BIA for breeding overlaps the proposed dredging and spoil disposal area, and breeding has been recorded on Goodwyn Island, foraging is seldom recorded in shallow inshore waters, such as those adjacent to PP/EII. BIAs for this species are defined by adding a 20 km buffer around known breeding locations and do not account for habitat heterogeneity within that buffer. As such, the BIA encompasses sheltered inshore waters of the dredging area which do not provide optimal foraging habitat. As a result, individuals may be encountered occasionally within PP/EII, but are not expected in large numbers.

4.3.1.5 SHOREBIRDS

Australia is situated within the East Asian–Australian (EAA) Flyway, a geographic region supporting populations of migratory shorebirds throughout their annual cycle (Bamford et al. 2008). Although exact timing varies between species, an approximate annual cycle for shorebirds in the EEA Flyway has been identified as: breeding (May to August); southward migration (August to November); non-breeding (December to February); and northward migration (March to May).

All the shorebirds identified in Table 4-1 are non-breeding visitors to Australia. During the non-breeding period in Australia, these migratory shorebirds are typically found in coastal and inland habitats where adult birds build up the energy reserves necessary to support northward migration and subsequent breeding (Bamford et al. 2008).

The Dampier Saltworks, ~2 km from Parker Point, has been recognised as an important bird area by Birdlife International (Birdlife International 2023). There have been significant counts of the oriental plover and sharp-tailed sandpiper within the saltworks.

The intertidal areas of the Burrup Peninsula and Dampier Archipelago have a range of intertidal habitats, including sandy beaches, rocky beaches, sand and mudflats and shallow rock platforms, providing habitat for numerous migratory and resident shorebirds. Intertidal areas immediately adjacent or within the PP/EII area are predominantly rocky/boulder shorelines sloping from existing port infrastructure into subtidal areas. No exposed sand or mudflats occur at low tide seaward of the rocky shoreline. As such, the shoreline directly adjacent to PP/EII provide minimal foraging areas for most migratory shorebird species. Of the shorebird species listed in Table 4-1, the rocky/boulder shoreline around PP/EII is most suited to the common sandpiper, ruddy turnstone, sanderling, whimbrel and Pacific golden plover. None of these species have a threatened listing under the EPBC Act or BC Act.

4.3.2 Marine Mammals

The marine and coastal environment of the Dampier Archipelago includes a unique combination of inshore reef and seagrass habitats and deeper water within channels between offshore islands, providing diversity in habitats able to support a variety of marine mammal species, including whales, dolphins and dugong. No habitats of specific interest to marine mammals occur within the project areas and management to avoid/minimise vessel strikes is discussed later.

4.3.2.1 HUMPBACK WHALE

Humpback whales migrate from feeding grounds in the Antarctic to breeding grounds in Camden Sound in the Kimberley region of Western Australia. A population of 33,000 humpback whales are known to make this migration annually (Salgado Kent et al. 2012). The north bound migration peaks adjacent to the Dampier area between approximately the last week of July and the first week of August. The peak of the south bound migration occurs during the last week in August and the first week of September. Jenner et al. (2001) suggested that the majority of migrating whales are found in waters deeper than 50 m; however, some individuals come closer to shore, particularly during the southern migration.

The Dampier region is not an aggregation or calving area for this species, although there is some suggestion that Nickol Bay (between Dampier and Karratha, outside the Port of Dampier) may constitute some form of milling area during the southern migration (Jenner and Jenner 2009; Jenner and Jenner 2011). More recent surveys indicate that Nickol Bay is used as a single day staging post, mainly by pods with calves using the areas close to shore during the southern migration (BMT Oceanica 2017).

Humpback whales are listed as Migratory under the EPBC Act and as Conservation Dependant fauna under the BC Act. Their global (non-statutory) listing by the IUCN is Least Concern. There is no current Recovery Plan for the species.

Although humpback whales have been recorded within Mermaid Sound and the area is listed as a BIA for migration of the species, sightings would be a rare event adjacent to the proposed dredging areas given the shallow water depth (<10 m) and proximity to existing industry. Whales may be present in the outer Mermaid Sound and around Spoil Ground 2B during the known migrations.

4.3.2.2 KILLER WHALE

The killer whale has a widespread distribution from polar to equatorial regions of all oceans and has been recorded in waters off all states of Australia (Bannister et al. 1996). Killer whales appear to be more common in cold, deep waters; however, they have been observed along the continental slope and shelf (Bannister et al. 1996), as well as in shallow coastal areas including waters of the Dampier Archipelago (IUCN-MMPATF 2023).

The species distribution and occurrence in Australia strongly reflect locations of prey aggregation, particularly breeding and feeding grounds (Morrice 2004), such as those of the humpback whale (Pitman et al. 2015).

The killer whale is listed as Migratory under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for the species.

Given the wide distribution of killer whales and their preference for colder, deeper waters, individuals are unlikely to occur in waters adjacent to the proposed dredging areas.

4.3.2.3 AUSTRALIAN HUMPBACK DOLPHIN

Australian humpback dolphins are limited to the shallow (< 30 m deep) tropical/subtropical coastal waters of the Sahul shelf of northern Australia and the southern waters of Papua New Guinea (Allen et al. 2012). In the north-west of Australia, the species has been recorded between Coral Bay and Roebuck Bay, including

within the Dampier Archipelago (Allen et al. 2012). However, there is a paucity of studies into distribution of the Australian humpback dolphin in the region or across WA more broadly. In the Pilbara, the species has been recorded up to 50 km from the mainland, however this finding was possibly associated with the location of offshore islands (Hanf et al. 2022).

The Australian humpback dolphin is listed as Migratory under the EPBC Act and Priority 4 under the BC Act. Australia has no adopted or made recovery plan for the species.

The waters within and adjacent to the dredging area and spoil grounds are consistent with habitats of known presence, and therefore, individuals may traverse the area.

4.3.2.4 INDIAN OCEAN / SPOTTED BOTTLENOSE DOLPHIN

Indian-Ocean bottlenose dolphins occur in tropical and sub-tropical, shallow waters from South Africa to the Red Sea and eastwards to the Arabian Gulf, India, China and Japan, southwards to Indonesia and New Guinea, and New Caledonia. Within Australia the species is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters, around the whole Australian coast (Allen et al. 2012).

Prince (2001) undertook aerial surveys of marine mammals and other large fauna of the Pilbara coast and concluded that Pilbara coastal waters support small populations of dolphins, the majority of which appear to be bottlenose. Frequent sightings of Indian Ocean bottlenose dolphins in the waters of the Dampier Archipelago are reported in Allen et al. (2012).

Indian Ocean bottlenose dolphins are listed as Migratory under both the EPBC Act and BC Act. There is no adopted or made recovery plan for the species in Australia.

Given the known sightings of this species, combined with its preference to inshore habitat, Indian Ocean bottlenose dolphins may occur in waters adjacent to the dredging area and spoil grounds.

4.3.2.5 AUSTRALIAN SNUBFIN DOLPHIN

Australian Snubfin dolphins are found in the North-west Marine Region in nearshore state waters along the coast from Cape Londonderry south to Roebuck Bay, with records of vagrants as far south as Exmouth Gulf. They have been recorded within the Dampier Archipelago, Port Hedland, Cable Beach and Roebuck Bay from the Montebello Islands, Exmouth Gulf and the North West Cape (Allen et al. 2012).

Australian Snubfin Dolphins share similar habitat preferences with Australian humpback dolphins. Feeding may occur in a variety of habitats, from mangroves to sandy bottom estuaries and embayments, to rock and/or coral reefs. Feeding primarily occurs in shallow waters (less than 20 m) close to river mouths and creeks.

The Australian snubfin dolphin is listed as Migratory under the EPBC Act and Priority 4 under the BC Act. Australia has no adopted or made recovery plan for the species.

The waters within and adjacent to the dredging area and spoil grounds are consistent with habitats of known presence, and therefore, individuals may traverse the area.

4.3.2.6 DUGONG

Dugongs are common in the Dampier Archipelago. The species has been recorded near various islands, including Rosemary Island, East Lewis Island, West Lewis Island, Keast Island, Legendre Island and Little Rocky Island (CALM 2005; Wells and Walker 2003). Dugongs have also been sighted in shallow, sheltered bays of the Burrup Peninsula and mainland, such as Regnard Bay and Nickol Bay (CALM 2005).

Dugong distributions are known to be directed towards seagrass beds, which are not present around Parker Point (Wells and Walker 2003). The Dugong's reproductive cycle is sensitive to food availability; breeding is delayed if sufficient food is not available.

Dugongs are listed as Migratory under the EPBC Act and as Other Protected Fauna under the BC Act. Their global (non-statutory) listing by the IUCN is Near Threatened. Dugongs are species of high cultural and conservation significance in Australia and many other coastal regions globally. Australia has no adopted or made recovery plan for dugongs.

Due to the absence of seagrass habitat in waters within or adjacent to the dredging area and spoil grounds, dugongs are highly unlikely to occur regularly or in large numbers adjacent to the dredging footprint. Individuals may infrequently transit between suitable foraging habitats.

4.3.3 Marine Reptiles

The Critically Endangered Short-nosed seasnake (*Aipysurus apraefrontalis*) and Leaf-scaled seasnake (*Aipysurus foliosquama*) were identified as potentially occurring within and/or adjacent to the Proponents facilities. Five threatened and/or migratory turtle species have been identified as potentially occurring within and/or adjacent to the dredging areas and spoil grounds; Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), Flatback (*Natator depressus*), Loggerhead (*Caretta caretta*) and Leatherback Turtle (*Dermochelys coriacea*). Of these, four species (green, hawksbill, flatback and loggerhead) are known to nest on the islands of the Dampier Archipelago (Biota 2009; Prince 1993). Subsequently, the Dampier Archipelago (including Rosemary island) has been identified by the May 2017 Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b) as critical nesting habitat for green, hawksbill and flatback turtles (Table 4-3).

Table 4-3. Peak (dark grey) activity of nesting female turtles and emerging hatchlings of relevant species

Species	Activity	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Green Turtle	Nesting												
	Emergence												
Hawksbill Turtle	Nesting												
	Emergence												
Flatback Turtle	Nesting												
	Emergence												

4.3.3.1 SHORT-NOSED AND LEAF SCALED SEASNAKE

The Short-nosed Seasnake is endemic to Western Australia, and has been recorded from Exmouth Gulf to the reefs of the Sahul Shelf, in the eastern Indian Ocean. Most specimens have been collected from Ashmore and Hibernia Reefs (Guinea and Whiting 2005). The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m.

Until recently breeding populations of the Leaf-scaled seasnake were only known from Ashmore and Hibernia Reefs in the Timor Sea, but the species has since been found during field surveys in the coastal waters of the Exmouth Gulf (Udyawer et al. 2020). The Leaf-scaled seasnake occurs in shallow water (less than 10 m in depth), in the protected parts of the reef flat, adjacent to living coral and on coral substrates.

A recent study has identified the Pilbara coast as a suitable habitat for the Short-nosed and Leaf-scaled seasnake, however the key locations for their preferred habitat included Ashmore Reef, Exmouth Gulf and the Montebello Islands, not the Dampier Archipelago (Udyawer et al. 2020).

Both species are listed as Critically Endangered under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for either species.

There is potential for these seasnakes to occur within the Dampier Archipelago, but given the lack of preferred habitat within and adjacent to the Proponents facilities it is considered unlikely that these species would be present.

4.3.3.2 LOGGERHEAD TURTLE

The Western Australian loggerhead turtle stock is one of the largest in the world and is distributed from the Gascoyne (Dirk Hartog Island) to Pilbara (Varanus Island) Regions (Commonwealth of Australia 2017b). Loggerhead turtles are a nearshore species which prefer warm, shallow continental shelves and coastal bays and estuaries (Limpus 2008a). The species feed in a wide range of tidal and subtidal habitats including coral and rocky reefs, seagrass meadows, and soft-bottomed sand or mud areas. Although loggerhead turtle nesting activity within the Dampier Archipelago (at Cohen Island) has been reported (CALM 1990), Pendoley et al. (2016) did not find any evidence of loggerhead turtle nesting activity in over 20 years of tracking data.

Loggerhead turtles are listed as Endangered and Migratory under the EPBC Act the BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b).

It is likely foraging or migrating adult Loggerhead Turtles will occur within the waters of the Dampier Archipelago. However, significant numbers within waters adjacent to the dredge area are unlikely, given the sparsity of optimal foraging habitat. Internesting females and hatchlings are expected to be absent.

4.3.3.3 GREEN TURTLE

Green turtles nesting in the Dampier Archipelago are part of the North West Shelf genetic stock, which is described as stable and one of the largest in the world (Commonwealth of Australia 2017b). Nesting of this species occurs from the Gascoyne (Ningaloo Coast) to the Kimberley (Lacepede Islands) Regions (Limpus 2002). The Dampier Archipelago has been identified as critical nesting habitat for the green turtle as well as a nesting BIA. The green turtle utilise the beaches of the Dampier Archipelago for nesting during the summer months (November – March) with peak nesting between December to February (Commonwealth of Australia 2017b; Limpus 2008b).

Information on green turtle movement patterns during the breeding season, that is specific to the Dampier Archipelago, is limited. Pendoley (2005) provides details of satellite tracking data for green turtles nesting on Rosemary Island. Female green turtles travelled up to 5 km but typically remained within shallow, nearshore waters less than 10 m deep. During non-breeding, green turtles typically occupy nearshore, coastal bays, feeding on seagrasses and macroalgae (Limpus 2008b). Although foraging grounds for green turtles within the Dampier Archipelago have not been identified with the available tracking data (Pendoley 2005), it is possible foraging individuals occur within seagrass habitat of the Dampier Archipelago. Satellite tracking data has revealed the Dampier Archipelago is important for green turtles on migration, though individuals appeared to traverse waters of the outer- most islands of the Archipelago, and the eastern side of the Burrup Peninsula, rather than waters close to Parker Point (Pendoley, 2005).

The nearest nesting beach with mean track density of more than one per night is Enderby Island, 17 km west of PP/EII (Pendoley et al. 2016).

Green turtles are listed as Vulnerable and Migratory under the EPBC Act and BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b).

Although the development envelope is overlapped by a BIA and habitat critical for internesting behaviours, at these distances, the density of internesting females and dispersing green turtle hatchlings within the waters adjacent to the Project development is expected to be low. Foraging and migrating green turtles may occur in the waters adjacent to the dredging and disposal areas; however, large numbers are not expected given the lack of significant foraging habitat and based on understanding of known migration routes.

4.3.3.4 LEATHERBACK TURTLE

No major leatherback turtle rookeries are known to occur in Western Australia, with scattered nesting reported in Queensland only (Limpus 2009a; Prince 2001). Leatherback Turtle diet is dominated by gelatinous organisms such as jellyfish, salps, squid and siphonophores , which influences their distribution, both in the open ocean and close to shore (Limpus 2009a).

Leatherback turtles are listed as Endangered and Migratory under the EPBC Act the BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b).

It is possible foraging or transient leatherback turtles may pass through waters of the Dampier Archipelago, but due to lack of significant food sources, individuals are not expected within the proposed dredging footprint.

4.3.3.5 HAWKSBILL TURTLE

The Dampier Archipelago is considered a major important nesting area for hawksbill turtles, with nesting beaches and a 20 km internesting buffer identified as critical habitat and a BIA (Commonwealth of Australia 2017b). In particular, Rosemary Island is recognised as an internationally significant nesting site for hawksbill turtles (Limpus 2009b). Evidence of hawksbill turtle nesting has also been found on a number of other islands, with nesting activity being highest on Enderby, Eaglehawk, Angel and Delambre islands (Pendoley et al. 2016). While nesting and hatching can occur year-round, notable peaks occur between October and January for nesting, and December and February for hatchling (Commonwealth of Australia 2017b).

Hawksbill turtles are found within rock and reef habitats, coastal areas and ponds. They are known to forage amongst vertical underwater cliffs, on coral reefs and on gorgonian (soft coral) flats, as well as seagrass or algae meadows (Limpus 2009b). Studies have shown the habitat of the inner Dampier Archipelago does not appear to be a key endpoint for foraging behaviour of the hawksbill turtle (Pendoley 2005).

Hawksbill turtles are listed as Vulnerable and Migratory under the EPBC Act and BC Act. Their conservation is managed under the most recent Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia 2017b).

While significant hawksbill turtle rookeries exist within the Dampier Archipelago (e.g., Rosemary Island), the nearest beaches to PP/EII with recorded nesting occur on Angel Island, 15 km to the north. Although the dredging footprint is overlapped by a BIA and habitat critical for internesting behaviours, given the distance to known nesting beaches and studies on internesting movements, it is unlikely internesting females and dispersing hatchlings will be present within the waters adjacent to the proposed dredging area. Foraging and migrating hawksbill turtles may occur in the waters adjacent to the dredging footprint; however, large numbers are not expected, given the lack of significant foraging habitat and our understanding of known migration routes.

4.3.3.6 FLATBACK TURTLE

Within the Dampier Archipelago, Flatback Turtle nesting has been recorded across a number of islands, with the Dampier Archipelago listed as a minor important nesting area under the recovery plan for marine turtles in Australia (Commonwealth of Australia 2017b). These nesting beaches, and a 60 km internesting buffer, are identified as habitat critical. The area is also a designated BIA, although the internesting buffer is larger at 80 km. A high frequency of nesting tracks has been recorded at Rosemary, Enderby and Delambre islands (Pendoley et al. 2016). Fossette et al (2021) conducted aerial surveys to assess the distribution and abundance of nesting turtles in the Pilbara, including the Dampier Archipelago. During the period of the survey, the nearest inter-nesting area to the Project area recorded for flatback turtles was on the northern side of West Lewis Island (~10-12 km distant) (AIMS 2020; Fossette et al. 2021). However, The nearest nesting beach with mean track density of more than one per night is Enderby Island, 17 km west of PP/EII (Pendoley et al. 2016).

Nesting typically occurs between October and March, peaking between November and January with hatchling emergence peaking in February and March (Commonwealth of Australia 2017b).

Knowledge of the internesting movements of flatback turtles within the Dampier Archipelago is provided by satellite tracking of 30 individuals nesting at Bells Beach and five at Delambre Island (Thums et al. 2018). During internesting, these flatback turtles remained within an average distance of 14.2 ± 8.8 km of their nesting site and in water depths of 8.1 ± 2.7 m.

Foraging flatback turtles may occur in the waters within and adjacent to the dredging footprint; however, large numbers are not expected, given the lack of significant foraging habitat and water depths (<10 m) being shallower than the apparent optimal depth of 50 m.

4.3.4 Elasmobranchs and Other Fish

Listed threatened and/or migratory elasmobranch species with the potential to occur within and/or adjacent to the dredging and disposal areas include the grey nurse shark (*Carcharias taurus*), scalloped hammerhead shark (*Sphyrna lewini*), giant manta ray (*Mobula birostris*) and reef manta ray (*Manta alfredi*). The PMST also identified two threatened (listed as Vulnerable) sawfish species: the green sawfish (*Pristis zijsron*) and dwarf sawfish (*P. clavate*) and the Migratory narrow sawfish.

4.3.4.1 SAWFISH

The known distribution of sawfish species in north-western Australia has been based on targeted sampling or discovery/donation of sawfish rostrum (Morgan et al. 2011). The closest targeted sawfish surveys to the Proponents port facilities have occurred at Onslow (Morgan et al. 2015; Morgan et al. 2017). Nursery sites for newborn sawfish pups are generally found in shallow, nearshore habitats often in close proximity to river mouths (Morgan et al. 2011). The dredging area is not located close to a river mouth and pupping has not been recorded in the Karratha area. Of the three species of sawfish identified as having the potential of occurring in the dredging area only the green sawfish has been confirmed through sightings or evidence of rostra in the Karratha area (Morgan et al. 2019; Morgan et al. 2011).

The known distribution of the green sawfish is from the Whitsundays in Queensland across northern Australian waters to Shark Bay in WA. They are known to primarily occur in inshore and offshore marine waters, or in shallow estuarine waters, however, the species does not inhabit freshwater. Green sawfish generally have a very small home range, occupy very shallow waters and are likely to avoid areas of high vessel traffic, such as PP/EII (Morgan et al. 2017).

The dwarf sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats, often influenced by large tides. Estuarine habitats are used as nursery areas by dwarf sawfish, with immature juveniles remaining in these areas up until three years of age. The majority of capture locations and donated rostra in Western Australia have been between King Sound and Cape Keraudren (Morgan et al. 2011).

In Australia, the Narrow Sawfish is found across northern Australia from the Pilbara Coast in WA) to Broad Sound (Queensland). It is a bentho-pelagic species that inhabits coastal and estuarine habitats. It occurs to depths of at least 40 m (Last and Stevens 2009). Adults mainly occur offshore while juveniles and pupping females require inshore and estuarine habitats.

Although the presence of sawfish species within inshore environments of the Dampier Archipelago has not been studied, research and commentary provided by Dr David Morgan (Harry Butler Institute) to support other projects in the Pilbara (i.e. Port Hedland Spoilbank Marina Project) have stated that sawfish have a home range of approximately 400 km. A collation of recent records occurring after 2010 of sawfish recorded or caught between 80 Mile Beach and south to Karratha, totalled 66 sightings (Morgan et al. 2019).

Globally, overfishing and habitat alteration have caused major declines in sawfish populations. In relation to coastal development, key threats to sawfish include habitat degradation from changes to coastal processes and reduction in water quality (DoE 2015).

The marine bioregional plan for the northwest region (Commonwealth of Australia 2012) identified changes to hydrological regimes, sea level rise and marine debris as threats of concern to sawfish. Of those identified marine debris is the only threat with a potential impact pathway due to the proposed maintenance dredging.

With application of appropriate industry standard management and mitigation measures to minimise shipboard waste generated by the dredging plant, the risk of impact to sawfish from marine debris generated by the proposed maintenance dredging activities is considered low.

Specific studies on sawfish behaviour in response to vessel interactions are limited, however, the general pattern of a response can be inferred based on their preferred habitat, movement patterns and response to human disturbances. Green sawfish forage in shallow, sandy or muddy, substrate, hunting on the incoming and low tide. Morgan et al (2017) used acoustic telemetry to track individual green sawfish near Onslow and found they occupied depths up to 2 m and moved up to 10 km during each tidal cycle. In addition, analysis of the movements of acoustically tagged sawfish has shown that hard barriers (e.g. rock walls) cause individuals moving along the coast to turn around, rather than following the structure offshore into deeper water and continuing along the coast (Morgan and Lear, unpublished data). On this basis, sawfish like other elasmobranchs are likely to alter their typical movement patterns in response to an operating vessel, such as swimming away and/or changing swimming speed.

Based on the:

- home range of sawfish;
- lack of suitable nursery sites;
- preference for shallow coastal waters and proclivity to avoid areas of high vessel traffic; and
- availability of similar suitable habitats along the Pilbara coast

it is considered that if present the density of sawfish in waters within the dredging area will be low.

4.3.4.2 SHARKS AND RAYS

The grey nurse shark (west coast population) has a broad inshore distribution, primarily in sub-tropical to cool temperate waters, and is predominantly found in the south-west coastal waters of Western Australia (Last and Stevens 2009). The species is listed as Vulnerable under both the EPBC Act and BC Act. Australia has no adopted or made recovery plan for grey nurse sharks. The species tend to be found in groups at specific aggregation sites around inshore rocky reefs or islands (Otway et al. 2003). The grey nurse shark has been recorded along the North West Shelf, but their distribution in Western Australia is largely confined

to the south-west coastal waters (Commonwealth of Australia 2014) and there are no known aggregation sites in Western Australia (Chidlow et al. 2005).

The scalloped hammerhead was given a Conservation Dependent listing under the EPBC Act by the threatened species scientific committee (TSSC) in 2018 (TSSC 2018). They are mobile animals that range widely over shallow coastal shelf waters. The species has a circum-global distribution in tropical and sub-tropical waters that shows strong genetic population structuring across ocean basins as it rarely ventures into or across deep ocean waters (TSSC 2018). The scalloped hammerhead is known to form large migratory schools and in Australia tend to move south during the warmer months. Adults inhabit waters adjacent to continental shelves, in water depths ranging from the surface to at least 275 m in depth, while juveniles are found close to shore in nursery habitats. Adult females are thought to occupy deeper water and move into shallower waters to mate and give birth (TSSC 2018).

Both the reef manta ray and giant manta ray are listed as Migratory under the EPBC Act and BC Act. There is no adopted or made recovery plan for either species in Australia. The reef manta ray is commonly sighted on the continental shelf, around tropical and subtropical coral and rocky reefs, islands and along coastlines, preferentially occupying shallow depths < 20 m (Armstrong et al. 2020). Reef manta rays are capable of long-distance dispersal when habitat is continuous but also display a high degree of site fidelity. The giant manta ray has a circumglobal distribution and is considered an oceanic species found predominantly in cooler, temperate to subtropical waters (Last and Stevens 2009).

The waters within and adjacent to the Proponents facilities are consistent with habitats of known presence for the reef manta ray and juvenile scalloped hammerhead sharks, and therefore, individuals of these species may traverse the area but are likely to avoid areas of high vessel traffic, such as PP/EII.

4.3.4.3 OTHER FISH

In general, the fish fauna of the outer islands of the Dampier Archipelago are dominated by coral reef fishes, while mangrove and silty bottom dwellers comprise the majority of the fish assemblages in the inner areas of the Archipelago, close to shore, such as PP/EII.

Hutchins (2004) studied the shallow-water fish fauna of the Archipelago (to a depth of 30 m) and found it comprised a total of 650 species and featured a prominent component of coral reef species (465) and to a lesser extent mangrove species (116), soft bottom inhabitants (106 species) and a relatively low number of pelagic species (67). Larger species that attract divers and recreational and commercial fishers include coral trout (Plectropomus spp.), tusk fish (Cheorodon spp.), rock cod, large potato cods (Epinephelus tukula) and manta rays (Manta birostris).

The southern bluefin tuna was the only threatened fish species (listed as Conservation Dependant under the EPBC Act) identified from the PMST search as likely to occur adjacent to the dredging and disposal areas.

Twenty-six fish species from the family *Sygnathidae*, listed as other protected matters under the EPBC Act, have been identified as potentially occurring within the Project area. Annual fish surveys undertaken over a ten year period at the artificial reef constructed in a near-shore area to the east of the Parker Point service wharf identified 111 reef fish species, dominated in abundance by *Acanthurus grammoptilus*, *Caesio teres* and *Neopomacentrus filamentosus* (MScience 2017), no fish from the family *Sygnathidae* were recorded.

Due to the lack of complex benthic habitats in waters adjacent to the dredging area, neither high abundance nor diversity of fish species are expected. Due to the proximity to Port of Dampier, commercial fishing activities are absent.

4.4 Introduced Marine Pests

Eight IMS (Table 4-4) have been recorded in the literature from the Dampier Archipelago and Mermaid Sound (Jones 2004b; Wells et al. 2009). Of the eight species, three crustaceans are well known, widely-distributed foulers in Australian waters. No studies or anecdotal data are available showing evidence that introduced crustaceans in the Dampier area have caused any ecological consequences, such as adverse impacts on native species. The only IMS known to have established a self-sustaining population is the tunicate *Didemnum perlucidum* (Wells 2018). First reported in Perth, WA, in 2010, *D. perlucidum* has since been well documented to have spread across 2,800 km of coastline to Exmouth and Dampier in the north (Bridgwood *et al*. 2014). Due to its established populations and widespread distribution, DPIRD has determined that eradication of this species from Australian waters is now unlikely. The Asian green mussel (*Perna viridis)* was reported during inspections of the dredge vessel, *Volvox Australia,* in 2006 and a mobile platform in 2011 (Wells 2018). This species does not currently have a self-sustaining population in the Pilbara but does have the potential to be detrimental to the local marine environment.

The Port of Dampier has also been part of the Western Australian State-Wide Array Surveillance Program (SWASP) that has been operating in Western Australian Ports since August 2016. The SWASP is a collaborative effort between all the WA Port Authorities and the DPIRDs Aquatic Biosecurity section. *D. perlucidum* is the only introduced marine species that has been detected during monitoring conducted for the SWASP in the Port of Dampier.

Table 4-4. Records of Introduced Marine Species in the Port of Dampier

Group	Species
Bryozoan	*Bugula neritina*
Crustaceans	*Amphibalanus Amphitrite*
	Amphibalanus reticulatus
	Megabalanus ajax
	Megabalanus rosa
	Megabalanus tintinnabalum
Mollusca	*Perna viridis*
Ascidians	*Didemnum perlucidum*

4.5 Marine Protected Areas

While there are no marine protected areas within the Port of Dampier, an area of approximately 122,170 ha was originally proposed as a marine reserve for the Dampier Archipelago based on the marine and coastal environment of the region in the 1990s. The combination of offshore islands, intertidal and subtidal reefs, mangroves, macroalgal communities and coral reefs, was identified by the Marine Parks and Reserves Selection Working Group report as having very significant conservation values (Buxton and Cochrane 2015; MPRSWG 1994).

The proposed reserve area is divided into three discrete areas intersected by the Port of Dampier. The eastern portion of the proposed marine park extends from the boundary of the Port of Dampier to include Delambre Island and waters adjacent to the eastern most limit of the proposed reserve (CALM 2005). The proposed marine park boundary in this area then extends along the coastline of Nickol Bay to Dixon Island.

The deeper waters of Nickol Bay are excluded from the proposed reserve. The western portion of the proposed marine park extends from Rosemary Island in the north to Enderby Island and also includes West Lewis, East Lewis, and Malus Islands. The proposed marine management area extends from Eaglehawk Island to the Fortescue River mouth in the south-west, and includes all waters up to approximately 20 km from the coast (CALM 2005).

Despite the issue of a draft interim management plan for the area in 2005, the marine protected area remains only 'proposed' at this stage.

In addition to these State-proposed marine parks, the Commonwealth has proclaimed a 1,251 ha marine reserve (the Dampier CMR) that forms part of the North-west Commonwealth Marine Reserves Network. The location and current zoning of the Dampier CMR are shown in Figure 4-2. The Dampier CMR consists of three zones: a Special Purpose Zone (Ports) (IUCN VI) covering 1,054 ha (~84% of the Dampier CMR), a Marine National Park Zone (IUCN II) covering 104 ha (~8%), and a Habitat Protection Zone (IUCN IV) covering 93 ha (~7%). A management plan for the North-west Commonwealth Marine Reserves Network, which covers the Dampier CMR, was prepared by the Commonwealth in 2018 (Director of National Parks 2018). The Dampier CMR sits more than 20 km from the disposal or dredging areas and is outside any realistic estimates for transport of suspended sediment at detectable levels.

4.6 Cultural Values

The Pilbara region and Dampier Archipelago contain a prolific and diverse range of Aboriginal heritage sites and objects dating back ~20,000 years, including; petroglyph (rock art) sites, ethnographic sites, standing stones, shell middens, artefact scatters, quarries and grinding patches (CALM 2005). The Dampier Archipelago, including the Burrup Peninsula, is an indigenous class feature on the National Heritage List. There is still a strong Aboriginal identity in the region today and the area is culturally and recreationally significant to Indigenous people.

The Proponent maintains an active program of Aboriginal heritage consultation and management. Previous consultation with Traditional Owners undertaken during capital dredging and other port developments at Dampier has not identified any marine heritage sites. The Proponent currently has an agreement with the Australian Government in relation to the National Heritage Listing of the Burrup Peninsula, including a management plan for this area's protection. This agreement and the associated obligations are specifically focused on the rock art and stone arrangements (the National Heritage values). The proposed dredging and disposal areas are outside the National Heritage Place.

Maintenance dredging and disposal operations in Dampier will be entirely in areas that have been previously disturbed during capital and port development works, thus the current proposed program is unlikely to result in new impacts to heritage sites.

4.7 Fisheries and Recreational Use

Aquaculture in the region is dominated by the production of pearls from the species *Pinctada maxima*. This industry utilises both wild-caught and hatchery reared oysters for the production of cultured pearls. The nearest aquaculture lease is for pearls is within Flying Foam Passage. A trial commercial tropical rock oyster program is currently underway within the Dampier Archipelago with the closest trial location on the western side of West Lewis Island. Maintenance dredging campaigns have been conducted since the establishment of the trial without reported effects.

Recreational fishing is popular in the Dampier Archipelago; however recreational fishers target subtidal reefs and rocky shoals offshore. There would be minimal effects on recreational fishers as the areas targeted

for dredging and spoil disposal are largely within those experiencing heavy vessel traffic and not used by fishers. Similarly, while commercial fisheries occur in the general area (State managed include: Nickol Bay Prawn Fishery, Pilbara Demersal Finfish Fisheries, Pearl Oyster Fishery Zone, Western Australian Mackerel Fishery, North Coast Blue Swimmer Crab Fishery and Western Australia Northern Shark Fishery. Commonwealth managed fisheries include: the Western Tuna and Billfish, Skipjack Tuna and Southern Bluefin Tuna Fisheries; however there is limited fishing under these Commonwealth managed fisheries in the coastal waters around Dampier), there are no active commercial fisheries in the areas of potential impact (i.e. within 250 m) of dredging and spoil disposal.

The waters of the Dampier Archipelago are used extensively for general boating, fishing, swimming and other recreation pursuits by the people of Dampier, Karratha, and other areas of the Pilbara.

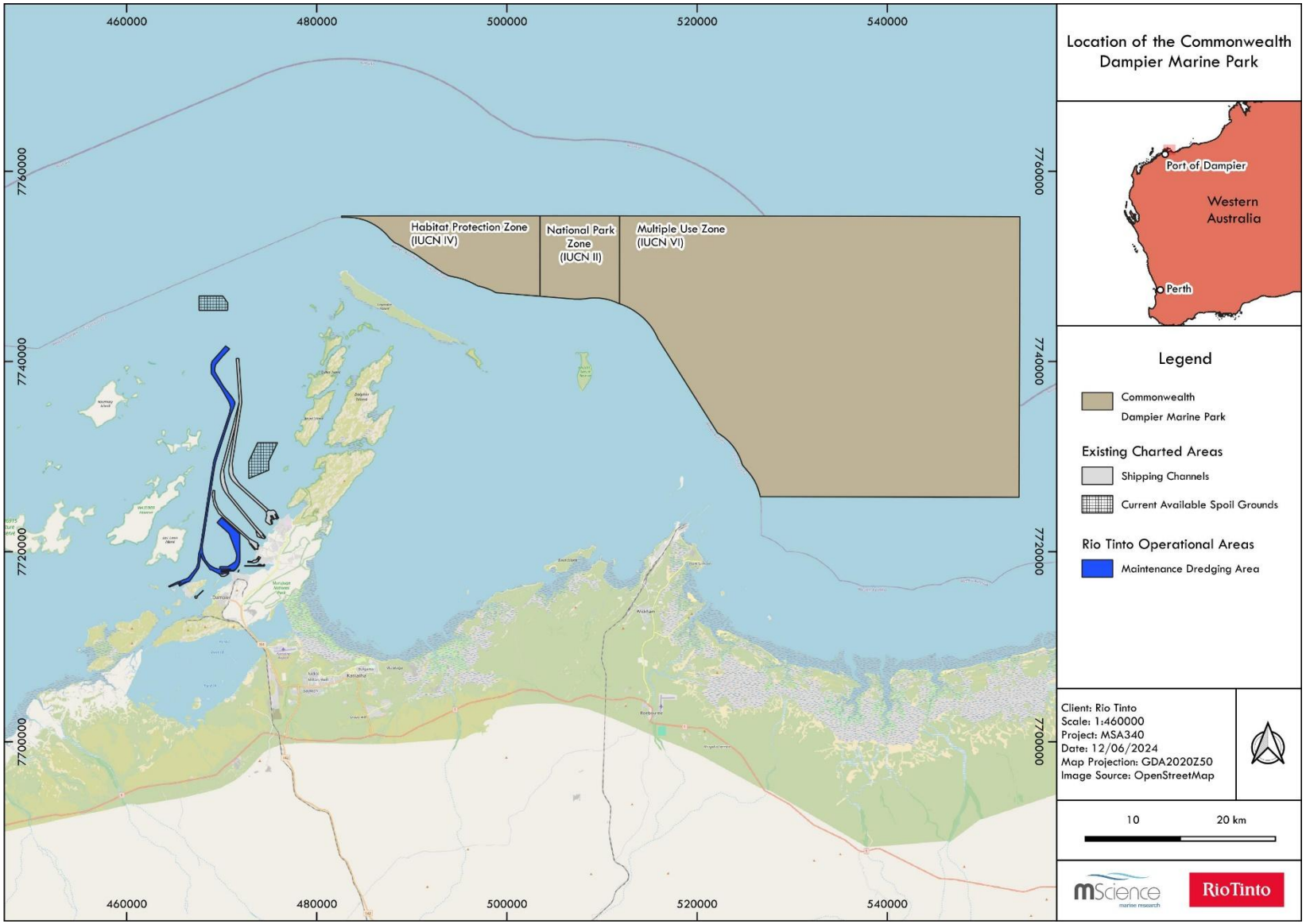

Figure 4-2. Location of the Commonwealth Dampier Marine Park

5 IMPACT ASSESSMENT

5.1 Rationale

An assessment of the risks of maintenance dredging to environmental, social and cultural values at Dampier has been undertaken to ensure that monitoring and management are directed at all areas of high risk. This assessment identifies the level of potential harm that various maintenance dredging consequences represent to environmental, social or cultural values. The outcome of the assessment has been used in developing management measures to avoid, reduce or mitigate impacts. Prior to each dredging campaign to be conducted under this permit, the risk assessment will be revisited as shown in Figure 5-1 and the LTMMP revised where necessary. In this section, "dredging activities" is used to include both uplift and disposal of spoil.

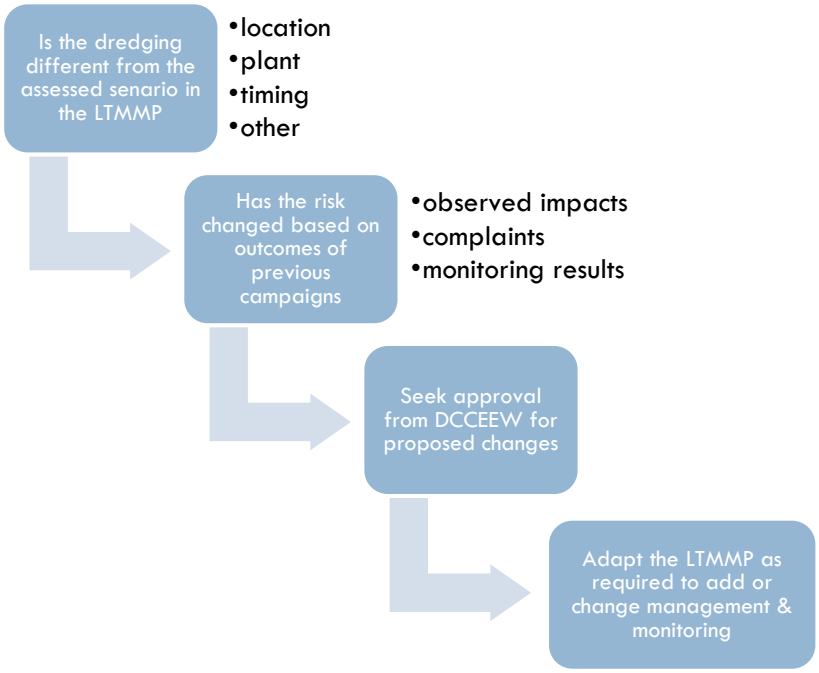

Figure 5-1. Adaptive management process for updating risk assessment before each campaign

5.2 Risk Assessment of Potential Impacts

The risk assessment was undertaken using a systematic approach, based on international best practice standards (AS/NZS ISO 31000:2018: Risk Management – Guidelines), of assigning a consequence and probability to potential negative outcomes of the various impacting processes of maintenance dredging and associated activities. Consequence and probability in this case have been drawn from experience with past dredging programs at Dampier and nearby ports and professional judgement based on experience with dredging programs elsewhere in the Pilbara Region. An outline of the risk assessment framework has been provided in Appendix D.

Dredging impacts may occur through a number of pathways (EPA 2016a) and may include:

Direct Impacts:

- the direct removal or destruction of benthic habitat in the dredged area;
- marine fauna collisions and disturbance from vessel movements;
- smothering of benthic organisms in dredge spoil placement locations

Indirect Impacts:

- changes to marine water quality from increased turbidity and sedimentation, and reduction in light penetrating the water column at distance from the dredging uplift and spoil disposal;
- introduction of invasive pest species translocated in dredging equipment;
- mobilisation and dispersion of contaminants from dredged sediments during uplift; and
- increased noise and lighting from associated vessel operations.

For maintenance dredging and disposal of dredge material, the risk of direct removal of habitat within the dredge area is negligible, as dredging and associated work is restricted to previously dredged areas where the original habitat has been removed. Thus assessment focuses on indirect impacts.

Risk ratings were assigned to each impacting process using the risk matrix in Appendix D. Inherent risk ratings assume minimum industry standard would be achieved without the application of any additional management controls.

Management controls relevant to each inherent risk were identified, applying the management response criteria and particularly focussing on those inherent risks rated as 'moderate' and above.

5.3 Outcomes

Appendix D presents the outcomes of the risk assessment, including the inherent risks and residual risks after management controls had been put in place.

If unmanaged, maintenance dredging in this area was assessed as having:

- One Critical risk (hydrocarbon spill);
- Ten High risks (associated with benthic communities and habitats, invasive marine species and potential social impacts);
- Ten Moderate risks (associated with marine environmental quality, marine megafauna and potential social impacts); and
- Two Low risks.

With management controls in place, maintenance dredging in this area was assessed as having:

- One High risk (injury of marine megafauna due to vessel/fauna interaction leading to potential reputational issues);
- Eleven Moderate risks (associated with benthic communities and habitats, invasive marine species, marine environmental quality, marine megafauna and potential social impacts); and
- Eleven Low risks.

Where a risk is assessed as above Low for any item, management actions are required. Management actions were developed (Section 6 and 7) to ameliorate risks to a Moderate or Low level, where possible.

Where it was assessed that there may be a chance that a Low or Moderate risk would produce a significant impact due to unforeseen circumstances, a monitoring program has been specified to allow for adaptive management (Section 8).

6 ENVIRONMENTAL MONITORING AND MANAGEMENT STRATEGY

The following sections detail specific actions for the monitoring and management of risks to environmental and social values assessed as above 'Low' in Section 5.

The management framework template for each environmental and/or social value has been provided in Table 6-1.

Table 6-1. Monitoring and management framework template

Component	Description
Value	What is to be protected.
Objective	What is intended to be achieved.
Risks Requiring Management	The scenario or activity with a risk of impact to environmental, cultural and/or social values greater than 'Low'.
Performance Indicator	Used to indicate the success or otherwise of particular management actions. Where management thresholds are exceeded, corrective actions/contingency plans are triggered.
Management Action	Management actions required to meet the proposed objective(s).
Monitoring Action	Monitoring actions required to meet the proposed objective(s).
Corrective Action / Contingency Plan	Actions and/or plans to be implemented if a performance indicator is not met.
Term (of action)	The period during a dredging campaign when the management action is required to be implemented.
Reporting	The way in which the outcomes of, and compliance with, the management actions are reported.
Responsibility	The responsible party for implementing the items of the framework.

Using the framework template presented in Table 6-1, monitoring and management frameworks have been developed to manage each maintenance dredging program conducted under the approved SDP:

- Section 6.1 Marine Megafauna Management;
- Section 6.2 Marine Environmental Quality (including Benthic Communities and Habitats) Management;
- Section 6.3 Chemicals, Hydrocarbons and Shipboard Waste Management;
- Section 6.4 Introduced Marine Species Management; and
- Section 6.5 Vessel Management.

Where responsibility for management actions is assigned to the Dredging Contractor below, the required action will be included in the dredge contract.

6.1 Marine Megafauna Management Framework

Value(s)	• Marine fauna, including marine mammals (in particular whales, dolphins and dugongs), turtles and sawfish. • Social surroundings
Objective(s)	To protect marine megafauna so that biological diversity and ecological integrity are maintained.
Risk(s) Requiring Management	• direct strike by vessels; • physical interaction with the dredge head (turtle and sawfish specific); • artificial lighting (turtle specific); and • underwater noise during dredge and disposal activities.
Performance Indicator(s)	• No injury or mortality incidents attributable to dredging for marine mammals, turtles and sawfish. • Light and noise mitigation measures included in the dredging contractors HSE management plan and implemented for the duration of each dredging campaign. • Compliance with monitoring criteria established below and within the SDP.

Item	Detail	Term	Responsibility
Management Action(s)	A Marine Fauna Observer (MFO) will be aboard the dredge when the dredge is in motion (see monitoring).	At all times during dredging activities	Dredging Contractor
	Vessels will be contractually required to comply with all relevant maritime legislation and operate safely and use only authorised shipping routes for all travel.	At all times during the dredging campaign	Dredging Contractor
	Vessels will comply with all requests from the Australian Maritime Safety Authority (AMSA) and the relevant harbour master unless it is unsafe to do so.	At all times during the dredging campaign	Dredging Contractor
	Vessel tracking systems, including automated identification systems (AIS) will be used on all project related vessels.	At all times during dredging activities	Dredging Contractor
	All dredging vessels will be required to comply with applicable parts of Division 8.1 of the EPBC Regulations 2000 regarding vessel interactions with cetaceans (e.g. distance, speeds) (Division 8.1 of the EPBC Regulations)	At all times during the dredging campaign	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	Ensure that the dredge is fitted with turtle exclusion devices on the drag heads. Dredging is not permitted unless these devices are installed and operational.	At all times during dredging activities	Dredging Contractor
	Implement procedural controls whilst dredging to minimise off-bed suction time. These controls must ensure that drag head water jets are activated at times when the drag heads are not in contact with the seabed (except where low density sediments are present), and pumps are in operation, to minimise the risk of turtle and sawfish capture.	At all times during dredging activities	Dredging Contractor
	Implement a soft start procedure (i.e. limit suction from the drag head until the drag head has engaged the seabed) whenever commencing dredging.	Prior to dredging activities	Dredging Contractor
	The length of the campaign will be minimised and planned as far as practicable to be outside of peak turtle nesting and hatchling emergence periods, and peak pupping periods for sawfish.	Refer to Table 4-3 for peak turtle nesting and emergence periods. Peak pupping periods for sawfish is August to December.	RTIO Project Manager
	Light levels from the dredging and support vessels will be minimised to those lights that are necessary for the safe operation of the vessels and all lights shown at anchor will be shielded to avoid light spill.	At night during dredging activities	Dredging Contractor
	Operational lights will not be directed towards the sea unless required for the safe operation of the vessel.	At night during dredging activities	Dredging Contractor
	Ensure all vessel equipment and machinery is in good condition and subject to regular maintenance while engaged on the Project to minimise underwater noise.	At all times during dredging activities	Dredging Contractor
	All Project vessels will be operated in accordance with EPBC Regulations 2000 – Part 8 Division 8.1	When in transit throughout the dredging campaign	Dredging Contractor
	Minimise the duration of run-time for vessel engines, thrusters and dredging plant by avoiding stand-by or running mode to the degree practical and consistent with safe operations.	At all times during the dredging campaign	Dredging Contractor

Item	Detail	Term	Responsibility
Monitoring Action(s)	A trained MFO must check using binoculars from a high observation platform (vessel bridge) for marine megafauna within a 300 metres monitoring zone. If marine megafauna are sighted within the monitoring zone, dredging and disposal activities must not commence until 30 minutes after the last individual is sighted/observed to leave the monitoring zone or the vessel is to move to another area to maintain a minimum distance of 300 m between the vessel and the observed megafauna.	Prior to dredging and disposal activities, during daylight hours	Dredging Contractor
	Monitoring for the presence of injured or dead turtles, dugongs or sawfish will be conducted by: • Examining the spoil in the dredge hopper for fragments of relevant marine fauna; and • Checking the dredge wake for floating relevant marine fauna or fragments of relevant marine fauna.	Regular checks (after each uplift of spoil at a minimum)	Dredging Contractor
Corrective Action(s) / Contingency Plan	In the event that turtle, dugong or sawfish injury or mortality occurs as a result of maintenance dredging campaigns completed under the SDP, the incident will be investigated. The investigation will inform the implementation of two trigger levels to guide the management action(s): **Level 1** One injured or dead turtle, dugong or sawfish is found during a single dredging campaign which is attributable to Project activity. Action: • Report the incident as per the reporting section • Check that all management procedures are being implemented. If not, then ensure implementation and increase compliance checks i.e. ensure pumping procedures and inspections of turtle chains are being carried out by the dredge contractor each time the drag head is lifted. **Level 2** More than one turtle, dugong or sawfish is found injured or dead during a single dredging campaign attributable to Project activity. Action: • As per Level 1	As soon as practicable after an incident has occurred.	RTIO Environmental Representative

Item	Detail	Term	Responsibility
Corrective Action(s) / Contingency Plan	• If management measures were being implemented, conduct a review of the current management measures to identify alternative or additional practical management measures that could be undertaken. Additional practical management measures may include: o Increasing the extent of the monitoring zone (e.g. 300 m to 500 m). o Limiting dredging operations in areas with repeated sightings of marine fauna during peak fauna activity periods (e.g. dawn/dusk for turtles).	As soon as practicable after an incident has occurred.	RTIO Environmental Representative
Reporting	Records of all marine fauna observations made during monitoring will be established and maintained.	For the duration of the dredging campaign.	Dredging Contractor
	Report any incident involving marine fauna to the RTIO Environmental Representative.	As soon as practicable after an incident is observed, but within 12 hours.	Dredging Contractor
	Report any injury or mortality of marine turtles or other threatened or specially protected fauna to: • The Department of Biodiversity, Conservation and Attractions (DBCA) Pilbara Regional Office (9182 2000) or Wildcare Helpline (9474 9055); and • The Department of Climate Change, Energy, the Environment and Water on 1800 803 732 or protected.species@environment.gov.au	Within 48 hours of receiving notification of the incident	RTIO Project Manager

6.2 Marine Environmental Quality (including BCH) Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna • Social surroundings
Objective(s)	To maintain the quality of water and manage sedimentation to ensure that any subsequent impacts to benthic communities and habitats and marine fauna are restricted to the zone of impact as defined in the SDP application.

Risk(s) Requiring Management	• Increased suspended sediment concentrations within the water column from dredging and disposal activities:
	  ○ Associated decrease in light and increase in sedimentation rates to benthic environments.
	  ○ Associated effect on marine fauna and flora in the water column and on the seabed.
	• Dredging outside the approved area.
	• Visible turbidity plumes have potential to result in community concerns and reputational impacts.

Performance Indicator(s)	• Establishment of all required environmental monitoring equipment and obligations relating to water prior to works commencing, in campaigns where monitoring is triggered. • No instances of exceedance of daily light index trigger values at the monitoring sites, as defined in Section 8.1, in campaigns where monitoring is triggered. • Conduct appropriate environmental monitoring (see Section 8) during dredging and disposal activities. • No direct disturbance to BCH outside approved dredging footprint and designated spoil grounds. • Dredges and dredging meet management actions specified in this table. • No dredging to take place outside the approved dredge footprint. • All dredge material to be disposed of within the boundaries of the approved spoil grounds.

Item	Detail	Term	Responsibility
Management Action(s)	Dredging will be planned on a weekly basis to consider the 7-day weather forecast. The weekly dredging plan will consider the proposed location of dredging and disposal with respect to the strength of metocean forcing factors in driving sediment plumes towards sensitive habitats and local values. The requirements to adjust a dredging plan to forecast metocean conditions will consider: • Previous dispersion models constructed for capital dredging at Dampier; and	Weekly during the dredging campaign	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	• Plume dispersion tracking conducted for recent maintenance dredging (2016, 2019, 2022 and 2024).	Weekly during the dredging campaign	Dredging Contractor
	Dredging will adapt to forecast weather conditions (e.g. storm surges, or strong winds and currents).	At all times during dredging activities	Dredging Contractor
	The dredge plant will utilise mechanical devices to reduce turbidity generation during dredging and disposal, such as turbidity-reducing ("green") valves in the overflow of the dredge.	At all times during dredging activities	Dredging Contractor
	The dredge hopper doors will be kept in good condition to minimise loss of sediment during transport.	At all times during dredging activities	Dredging Contractor
	Dredging and disposal will only occur in the permitted areas specified on approved plans and with material approved in the Sea Dumping Permit.	At all times during dredging activities	Dredging Contractor
	Dredge plant will be managed to ensure that there is no visible evidence of oil, grease, scum, litter or other objectionable matter in the water.	At all times during dredging activities	Dredging Contractor
	All practical measures will be implemented to minimise the concentration of suspended solids released during the loading and disposal of dredge material.	At all times during dredging activities	Dredging Contractor
	Routes to and from the spoil ground will be selected to consider, safety, environmental impacts and to minimise the risk of spillage outside of defined areas.	At all times during dredging activities	Dredging Contractor
	Accurate positioning systems will be used on the dredge plant to ensure direct impacts are restricted to the approved dredging and disposal areas.	At all times during dredging activities	Dredging Contractor
Monitoring Action(s)	Implement water quality monitoring program for dredging campaigns anticipated to take more than seven days of active dredging (see Section 8.1).	Throughout the dredging campaign (if scheduled for seven days or more) and for seven days post completion of dredging activities	RTIO Project Manager

Item	Detail	Term	Responsibility
Monitoring Action(s)	Implement benthic habitat monitoring program in the event of a water quality exceedance (see Section 8.2).	Post dredging in the event of a water quality exceedance	RTIO Project Manager
	Auditing of condition, positioning and sailing routes of the dredging plant.	Throughout the dredging campaign	RTIO Project Manager
	Conduct bathymetric survey at the nominated spoil ground(s) for the specified dredge and disposal campaign to evaluate changes in seafloor bathymetry.	Prior to dumping activities commencing and within one month of the conclusion of dumping activities	RTIO Project Manager
Corrective Action(s) / Contingency Plan	See adaptive management section of the water quality monitoring program (Section 8.1).	As soon as practicable after an exceedance is observed	RTIO Project Manager
	See adaptive management section of the benthic habitat monitoring program (Section 8.2).	As soon as practicable after a significant impact is observed	RTIO Project Manager
	Investigate any incidents of dredging and/or disposal of dredged material outside of approved areas. Assess the potential risk to environmental, social and cultural values the incident may have had.	As soon as practicable after an incident is observed	RTIO Project Manager
Reporting	Provide track plots of the dredge plant (or certified extract of the ships logs) to the RTIO Project Manager.	Daily during dredging activities	Dredging Contractor
	Incident report for dredging and/or disposal of dredged material outside of approved areas provided to RTIO Project Manager. Including (as a minimum) details of the incident, the measures taken, the success of those measures in addressing the incident or risk and any additional measures proposed to be taken.	Throughout the dredging campaign	Dredging Contractor
	Final reports on turbidity and plume monitoring to made available to regulators.	Upon request at the end of the monitoring program	RTIO Project Manager

6.3 Chemicals, Hydrocarbons and Shipboard Waste Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna • Social Surroundings
Objective(s)	To maintain the quality of water, sediment and biota so that environmental and social values are protected.
Risk(s) Requiring Management	• Hydrocarbon spill event or unplanned discharge from a vessel associated with dredging activities. • Chemical spill event or unplanned discharge from a vessel associated with dredging activities. • Unauthorised discharges of solid or liquid hazardous waste to the marine environment (and the subsequent environmental and social impacts).
Performance Indicator(s)	• Compliance with MARPOL. • No unauthorised discharges of solid or liquid hazardous waste (including hydrocarbons) to the marine environment. • Number of incidents where waste has entered the marine environment, or incorrect storage / segregation. • Vessel premobilisation to include checks and information on waste management practices.

Item	Detail	Term	Responsibility
Management Action(s)	All chemical substances used on the dredge plant must comply with the dredge contractor's chemical management system. At a minimum, all chemicals must be recorded in a chemical register and maintained for the duration of the dredging campaign, which identifies the chemical properties of the substance, storage and handling requirements and any potential for environmental harm.	For the duration of the dredging campaign.	Dredging Contractor
	All vessels will manage wastes in accordance with Port of Dampier requirements appropriate to the class of vessel (including AMSA and MARPOL legislative requirements).	For the duration of the dredging campaign.	Dredging Contractor
	All waste or sewage will be disposed using the following pollution prevention and waste management measures: • No disposal of wastes within the marine environment within State Waters; • Seagoing vessels will manage waste in accordance with MARPOL 73/78 Annex IV, vessel waste logs and waste receipts (including sewage receipts) to be kept on board;	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	• Disposal of any wastes outside of State Waters to comply with MARPOL Annex V; • Adoption of waste minimisation initiatives wherever practicable, in particular with regards to procurement and (sub)contracting processes; • Other than sewage or putrescible waste, all waste must be separated into scrap steel, chemical wastes, hazardous wastes, recyclable wastes (paper, cardboard, aluminium cans) and general wastes; • Waste skips and bins will be sufficient in number and fitted with lids to avoid fugitive wastes; • All bins shall be clearly labelled including waste oil storage tanks; • All employees and contractors involved in the handling, transfer, storage, and disposal of oil and hazardous substances will be appropriately trained, including the relevant regulatory requirements; • Use of licensed waste contractors for collection and disposal of vessel waste (including food scraps), untreated sewage and listed wastes; • Any wastes received at Dampier shall be removed from site for disposal at approved landfill or recycling facilities.	For the duration of the dredging campaign.	Dredging Contractor
	Operational spill management controls to prevent hydrocarbon and other spills into the marine environment during dredging activities include: • Daily inspection logged for excessive oil and grease from cutter and drag heads. • Complying with vessel traffic management protocols. • Detailed records will be maintained of all vessel collision incidents (see Section 6.5). • Bunkering of larger vessels (e.g. TSHD) will occur at facilities suitable for larger vessel, such as the Pilbara Ports Authority bulk liquids berth or Toll King Bay facility in the Port of Dampier. Smaller vessels may utilise RTIO provided refuelling facilities. • Bunkering will occur in accordance with the standard operating procedures for the facility being used. • The hydraulic oil systems on all vessels will be well maintained and regularly inspected with appropriate maintenance records and certificates. No obvious leaks. Vessels will be equipped with standard low pressure alarms and shut down systems to minimise hydrocarbon loss in the event of a burst hydraulic hose.	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	• Vessels will comply with AMSA Marine Order 32 (2017) (Online Link) with clearly identified roles and responsibilities. • Regular and documented maintenance of all vessels and equipment. • All hydrocarbons stored on deck will be bunded in a secured area. • Relevant employees and contractors involved in the storage, handling, transfer and disposal of fuel and other materials will be trained to ensure they are aware of their responsibilities systems, processes and procedures. • Relevant contractors will be required to undertake spill response training and appropriate training exercises in accordance with their plans. • AIS on all vessels. • Regular drills and exercises for crews.	For the duration of the dredging campaign.	Dredging Contractor
Monitoring Action(s)	Housekeeping inspections to ensure appropriate storage of waste and no accumulation of waste materials in work areas.	For the duration of the dredging campaign.	Dredging Contractor
	Should a significant hydrocarbon spill occur within the Proponent's dredge design area over the life of the SDP a further sediment sampling program (consistent with the NAGD) would be required to update the sediment quality assessment conducted for the application for SDP	Prio to the next maintenance dredging campaign.	RTIO Project Manager
Corrective Action(s) / Contingency Plan	Spill Response: • In the event that waste is lost overboard, all reasonable and practicable measures must be employed to retrieve the waste. • Any hydrocarbon spill will be responded to following the procedures stated in the most current RTIO Port Handbook for the Port of Dampier. • First response hydrocarbon spill containment and recovery equipment will be available at RTIO operations to respond in the event of a potential hydrocarbon release. The appropriate harbour authority (Pilbara Ports) will then coordinate large scale responses.	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Reporting	Uncontrolled and unauthorised waste discharges will be reported to the WA Department of Transport Marine Environmental Emergency Response Unit (for all spills within State Waters), or AMSA (spills outside of State Waters). • WA DTMI - discharges will be reported using the Marine Pollution Report form (POLREP) via email. This can be accessed online (POLREP) ○ POLREPs are required for any illegal vessel discharge to the marine environment. • AMSA - discharges will be reported using procedures found on the AMSA Website.	Immediately (but no later than 12 hours) from the incident occurring	Dredging Contractor
	Record the quantities and types of waste received and disposed of and the disposal method.	For each disposal	Dredging Contractor
	Report listed wastes to RTIO.	As required	Dredging Contractor
	Report any significant loss of waste material to RTIO Marine Operations (on VHF 16, or by telephone on 08 9183 7111 or 0417 914 588) & Pilbara Ports Dampier VTS (on VHF 11 or 16, or by telephone on 08 9159 6556 or 24-hour emergency mobile 0428 888 800).	As soon as practicable after the incident.	Dredging Contractor

6.4 Invasive Marine Species Management Framework

Value(s)	• Benthic communities and habitats • Marine fauna
Objective(s)	To prevent the introduction and/or spread of IMS to the marine environment at Dampier via vessels associated with dredging and disposal.
Risk(s) Requiring Management	Dredging vessels/plant and associated support vessels have the potential to transport IMS to site as biofouling or in ballast water.
Performance Indicator(s)	• Compliance throughout the project with IMS assessment process required by WA DPIRD. • Compliance with Australian Quarantine inspection Service (AQIS) mandatory ballast water requirements. • No establishment or movement of IMS within waters adjacent to the development as a result of the dredging and spoil disposal activities.

Item	Detail	Term	Responsibility
Management Action(s)	All Project vessels, including dredge and dredge support vessels, will be subject to Australian biofouling management requirements for commercial vessels (Link to online document).	For the duration of dredging and disposal activities.	Dredging Contractor
	All vessels will be required to undertake the RTIO IMS risk assessment, which considers: • vessel type. • cleaning and marine pest inspection history. • the presence, age and suitability of antifouling coating. • the type and treatment history of internal seawater systems. • previous areas of operation (including climatic region, and the presence of marine pests of concern) since the last documented cleaning and/or marine pest inspection, and the duration the vessel spent in those areas. • potential for residual sediment. • the nature of previous vessel operations. • any periods spent out of water immediately prior to mobilisation.	Prior to entry to the port and commencement of dredging activities	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	Based on the outcomes of each IMS assessment, implement management measures commensurate with the risk (e.g. treatment of internal systems, IMS inspections or cleaning) to minimise the likelihood of IMS being introduced.	For the duration of dredging and disposal activities.	Dredging Contractor
	Project vessels will manage their ballast water using one of the approved ballast water management options, as specified in the Australian Ballast Water Management Requirements (DAWE 2020, version 8) and in accordance with the Biosecurity Act 2015.	For the duration of dredging and disposal activities.	Dredging Contractor
Monitoring Action(s)	Maintain records of vessel compliance with RTIO IMS risk assessment.	For the duration of the dredging campaign.	RTIO Project Manager
Corrective Action(s) / Contingency Plan	Should a marine pest listed on the Australian Priority Marine Pest List (APMPL) be detected (or suspected to be present), notify DPIRD via the Fishwatch line 1800 815 507. DPIRD officers would then determine what management was required.	Within 24 hours of becoming aware of the issue.	RTIO Project Manager
Reporting	The IMS risk assessment report must be provided to the RTIO Environmental Representative and any recommendations for further cleaning or biosecurity measures completed prior to starting work on the project. The report and documents providing evidence of required works must be held in the Project Office and be available for WA DPIRD inspectors.	Prior to vessel(s) entering the Port of Dampier.	Dredging Contractor

6.5 Vessel Management Framework

Value(s)	• Marine environmental quality • Benthic communities and habitats • Marine fauna • Social surroundings
Objective(s)	To minimise the risk of vessel collision/grounding and the resulting environmental and social impacts.
Risk(s) Requiring Management	• Vessel collision. • Vessel grounding.
Performance Indicator(s)	No vessel collisions (vessel to vessel or vessel to marine infrastructure) or groundings during dredging and disposal activities

Item	Detail	Term	Responsibility
Management Action(s)	A communication plan with RTIO Marine Coordinators will be in place, Marine Coordinators will be in control of all RTIO vessel sailing movements within RTIO channel (sailing to dredging area or to dredge disposal area for dumping)	For the duration of the dredging campaign.	Dredging Contractor
	All vessels will operate in accordance with the requirements of the Pilbara Ports Port of Dampier Handbook.	For the duration of the dredging campaign.	Dredging Contractor
Monitoring Action(s)	Auditing of positioning and sailing routes of the dredging plant.	Throughout the dredging campaign.	RTIO Project Manager
Corrective Action(s) / Contingency Plan	Investigate any incidents of vessel collision/grounding. Assess the potential risk to environmental, social and cultural values the incident may have had.	As soon as practicable after an incident is observed.	RTIO Project Manager
Reporting	Any vessel collision or grounding will be reported to the DTMI using the online marine incident report form. (Online Link)	Within 72 hours of a reportable incident.	RTIO Project Manager

7 DREDGE SPOIL MANAGEMENT STRATEGY

7.1 Alternatives to Sea Disposal

For each maintenance dredging campaign that arises within the life of the LTMMP, the Proponent will review the potential for non-dredging options to avoid the generation of spoil requiring sea disposal via a comparative assessment of the risks of various options to dredging campaign cost, human health and the environment. This approach has been used by the Proponent for recent dredging programs in Dampier and Cape Lambert and the template developed for those assessments has been adopted here.

That assessment uses a semi-quantitative ranking of the risks (consequence x probability) where 1 represents a "minimal risk", 2 a "moderate risk" and 3 an "extreme risk". As a guide, a ranking of 3 would generally rule out an option. The assessment included in the SDP application is presented in Appendix E.

The spoil to be removed is generally fine unconsolidated sediments with a high proportion of fines and water. Disposal of fine unconsolidated sediments with high water content is not viable to be used as land fill (land reclamation) or for use in construction purposes around the margins of the Port of Dampier.

Much of the area around the margins of the Port of Dampier is either of high conservation value (e.g. mangroves, anthropological or archaeological sites) or of high value for industrial or port usage. Effective disposal of this material would require a large surface area for dewatering and return of dewatering with attendant high suspended sediment load to sensitive nearshore environments. Furthermore, the disposal of fine unconsolidated sediments on land risks the generation of dust over the town of Dampier (upon completion of the decanting/drying process) causing nuisance/complaints from residents and the spread of salinity.

7.2 Waste Prevention

Section 4.1.2 of the NAGD (2009) establishes a requirement to identify opportunities for minimising current and future contamination of sediments. In addition to potential contamination of sediments, the waste prevention guidance in the NAGD addresses the ingress of physical sediment volumes requiring maintenance dredging.

Recent analysis of sediments from the proposed dredge footprint found that the sediments were safe for unconfined ocean disposal (O2 Marine 2025). It is likely that these sediment results will remain current for the life of the LTMMP, and sediment contamination issues will not be relevant to this LTMMP.

Experience with managing channels and scheduling maintenance dredging at several major ports along the Pilbara Coast suggests that here the primary driver of sediment movement, and thus infill of channels, is cyclonic activity rather than anthropogenic influences. The profound effects of Pilbara cyclones on suspending sediments and driving the transport of sediment across the North West Shelf have been well documented by Dufois et al. (2017; 2018).

The Proponent manages the potential contamination of sediments and addition to the sediment load of the area from its port activities under its normal operating procedures. The mechanisms by which this may occur are surface runoff of sediment laden surface water into the marine environment, dust entering the marine environment and loss of iron ore product at the wharf. Studies have been undertaken focussing on the reduction of these contributions and management has been put in place to implement that reduction. The potential impacts of these mechanisms are managed through containment and treatment of runoff, control of ore moisture content to reduce dust generation, containment and suppression of dust, engineering design to reduce spillage and collection of spillages.

The Proponent is committed to continuing to find better ways to minimise environmental impacts, as such, these management procedures are updated regularly. Thus, no specific additional waste prevention options are described here.

7.3 Dredge Spoil Management Framework

Value(s)	• Benthic communities and habitats. • Marine environmental quality. • Social surroundings.
Objective(s)	To minimise pollution and sea disposal and the resulting environmental and social impacts.
Risk(s) Requiring Management	• Dredge spoil placement. • Disposal of dredge spoil outside the approved area.
Performance Indicator(s)	• Comparative assessment of the risks of various options to dredging campaign cost, human health and the environment completed. • All dredge material to be disposed of within the boundaries of the approved spoil grounds. • Minimal mounding of spoil within the spoil grounds.

Item	Detail	Term	Responsibility
Management Action(s)	Review the potential for non-dredging options to avoid the generation of spoil requiring sea disposal via a comparative assessment of the risks of various options to dredging campaign cost, human health and the environment, using the template provided in Appendix E.	Prior to planning each dredging campaign implemented under the SDP.	RTIO Project Manager
	Establish clear locations and boundaries for spoil disposal with the Dredging Contractor.	Prior to commencing dredging and disposal activities.	RTIO Project Manager
	Include relevant checks on the vessels GPS and navigation systems to ensure correct operation of the system.	Prior to commencing and during dredging and disposal activities.	Dredging Contractor
	Vessel tracked by GPS during disposal operations. Ensure positioning system is active and to suitable accuracy.	For the duration of the dredging campaign.	Dredging Contractor
	Routes to and from the spoil ground will be selected to minimise the risk of spillage outside of defined areas.	For the duration of the dredging campaign.	Dredging Contractor

Item	Detail	Term	Responsibility
Management Action(s)	Disposal will only occur in the permitted areas specified on approved plans and with material approved in the Sea Dumping Permit. Dredging Contractor to confirm the dredge vessel is positioned (using DGPS) within approved footprints prior to spoil disposal and during spoil disposal.	For the duration of the dredging campaign.	Dredging Contractor
	Distribute spoil over disposal ground in accordance with Pilbara Ports instructions to minimise mounding of spoil within the disposal area as far as practically possible and to not limit navigable access by the dredge to other areas of the disposal site or cause a grounding of the vessel.	For the duration of the dredging campaign.	Dredging Contractor
Monitoring Action(s)	Conduct bathymetric survey for a specified dredge and disposal campaign to confirm effective capacity of the spoil ground	Prior to commencement of dumping activities	RTIO Project Manager
	Conduct bathymetric survey for the specified dredge and disposal campaign to evaluate changes in seafloor bathymetry.	Within one month of the conclusion of dumping activities	RTIO Project Manager
Corrective Action(s) / Contingency Plan	Should any non-compliance issues with the LTMMP/SDP be identified, immediate measures to stop/mitigate/redress such non compliances will be made.	As soon as practicable after a non-compliance has been identified.	RTIO Project Manager
	<u>Simultaneous Dredging Contingency Planning</u> The Proponent will consult with Pilbara Ports and the DTACC to determine whether other port users are proposing to undertake dredging/dumping which would have cumulative impacts to the planned campaign. As has been common practice at the Port of Dampier, port users sometimes commission the same dredge previously commissioned by another port user to undertake maintenance dredging (to defray mobilisation costs), thereby assisting to minimise the risk of simultaneous dredging programs.	Prior to any dredging campaign	RTIO Project Manager
Reporting	Daily reporting of disposal activities.	For the duration of dredging and disposal activities.	Dredging Contractor
	Reporting of non-compliance issues to DCCEEW	As soon as practicable after a non-compliance has been identified.	RTIO Project Manager

8 OPERATIONAL MONITORING PROGRAMS

The following monitoring programs will be undertaken to support the management measures listed in Section 6.2 for marine environmental quality (including BCH) management:

- Water quality monitoring; and
- Monitoring of BCH.

Monitoring compliance with other management measures, such as marine fauna management, hydrocarbon, chemical and waste management, IMS assessments and vessel management will be undertaken by a rolling audit program.

8.1 Water Quality Monitoring

8.1.1 Rationale

The water quality monitoring program is based on the assumption that biota of the area have survived water quality impacts of previous dredging and disposal campaigns over time frames of several months, compared to the less than six-week period anticipated for the dredge campaigns covered under this LTMMP.

The monitoring of dredging-derived sediment plumes conducted during past maintenance dredging campaigns at the Port of Dampier suggests plumes may be visible within 1 - 2 km around the dredging and disposal site, however, it is possible that they may disperse further if unexpected events occur (strong winds, tides; or patches of very fine sediment). If plumes of sufficient suspended sediment concentration are regularly intersecting sensitive habitats, impacts on benthos may occur.

It is not anticipated that suspended sediment concentrations (SSC) will be an issue at the dredge uplift location, particularly in light of the plumes generated by vessel movements in the area, but it is important to determine if sedimentation and light loss as a result of plumes could occur at frequency-intensity-duration (FID) combinations which would cause mortality of nearby coral communities. The coral communities closest to Spoil Ground 2B are >5 km to the east and are unlikely to be intersected by plumes generated by disposal activities. Therefore, only FID patterns of suspended sediment at coral communities nearby to Spoil Ground A/B require monitoring. A water quality monitoring program will be implemented to determine whether revision of the management of potential indirect impacts to benthic primary producers from increased turbidity and reduced light using *in-situ* instrumentation is required in successive campaigns.

The risk of significant impact on water quality has been assessed as low and previous maintenance dredging campaigns have not been shown to have significant impacts on water quality around sites with sensitive benthic receptor communities (MScience 2021; MScience 2024). Based on the intensity of these events, any significant impacts on benthic communities are highly unlikely for durations of less than 7 days (Jones et al. 2019). Therefore, real-time monitoring and adaptive management is proposed only for campaigns planned for longer than 7 days of active dredging and disposal activity.

8.1.2 Objectives

Key objectives for monitoring of water quality during disposal activities are to:

1. Confirm plumes outside of the predicted zone of impact for spoil disposal do not exceed intensity-frequency-duration criteria which result in mortality of benthos.
2. Inform ongoing spoil disposal activities and any requirement to manage these.

8.1.3 Methodology

Water quality monitoring instrument sets are to be placed at the sites listed in Table 8-2and shown in Figure 8-1 prior to commencement of a dredging campaign likely to extend for seven days or more.

Instrument sets would include telemetered light meters, and nephelometers for recording turbidity. Instruments would be set to measure every 30 minutes (at a minimum) and, when relevant, to regularly transmit data (for example every 6 hours).

Instruments will be deployed and tested prior to commencement of any sediment disturbance from the dredging program and for seven days following the completion of the dredging activity. The proposed sites have been used previously for the Proponent's (and other operators) long-term water quality monitoring programs at Dampier and have documented turbidity and light profiles of many years data to obviate the need for extended monitoring periods before or after dredging.

The monitoring parameters and schedule will follow those detailed in Table 8-2.

8.1.4 Management Triggers

Water quality triggers have been derived from the most relevant published works on Pilbara dredging triggers (Jones et al. 2019; Jones et al. 2020). Light-based triggers are the most appropriate monitoring metric to determine potential water quality impacts from maintenance dredging campaigns at Dampier, and used the triggers developed by the WAMSI Dredging Science Node Program (as shown in Table 8-1). A trigger would only be deemed to be reached where it was determined that there was a causal link to dredging in part or whole for the reduction in light levels below the threshold. That determination would be made on the basis of water quality at Reference sites from that period and reference to turbidity recordings and, where available satellite images of plumes.

Table 8-1. Water quality thresholds for management triggers at Test Sites (Jones et al. 2019).

Thresholds			
Level 1		**Level 2**	
Duration of running mean calculation	DLI*	Duration of running mean calculation	DLI*
7 day	1.8	7 day	0.6
14 day	2.5	14 day	1.1
28 day	3.1	28 day	1.8
*DLI – Daily Light Index (mol photon/m^2/d) – stated as running means that Test Sites are not to drop below			

Table 8-2. Water quality and benthic habitat monitoring sites, parameters and schedule

Site Name (ID)	Easting (GDA2020Z50)	Longitude (GDA2020Z50)	Monitoring Program			
			Water Quality		Benthic Communities and Habitats	
			Parameters	Schedule	Parameters	Schedule
Test Sites						
Conzinc Island (CONI)	476833	7729144	• Light (PAR); and • Turbidity (NTU)	During dredging and disposal for campaigns >7days (plus 7 days post-dredging activities). NTU and PAR measured every 30mins, 24hrs a day. Telemetered data are regularly transmitted (for example every 6 hours).	Images and Observations (as per section 8.2.4)	Pre-dredging for campaigns anticipated to take >7days. Post-dredging in the event of a water quality trigger exceedance.
Angel Island (ANGI)	478702	7734556				
Reference Site						
Gidley Island (GIDI)	478825	7736385	• Light (PAR); and • Turbidity (NTU)	During dredging and disposal for campaigns >7days (plus 7 days post-dredging activities). NTU and PAR measured every 30mins, 24hrs a day. Telemetered data are regularly transmitted (for example every 6 hours).	Images and Observations (as per section 8.2.4)	Pre-dredging for campaigns anticipated to take >7days. Post-dredging in the event of a water quality trigger exceedance.

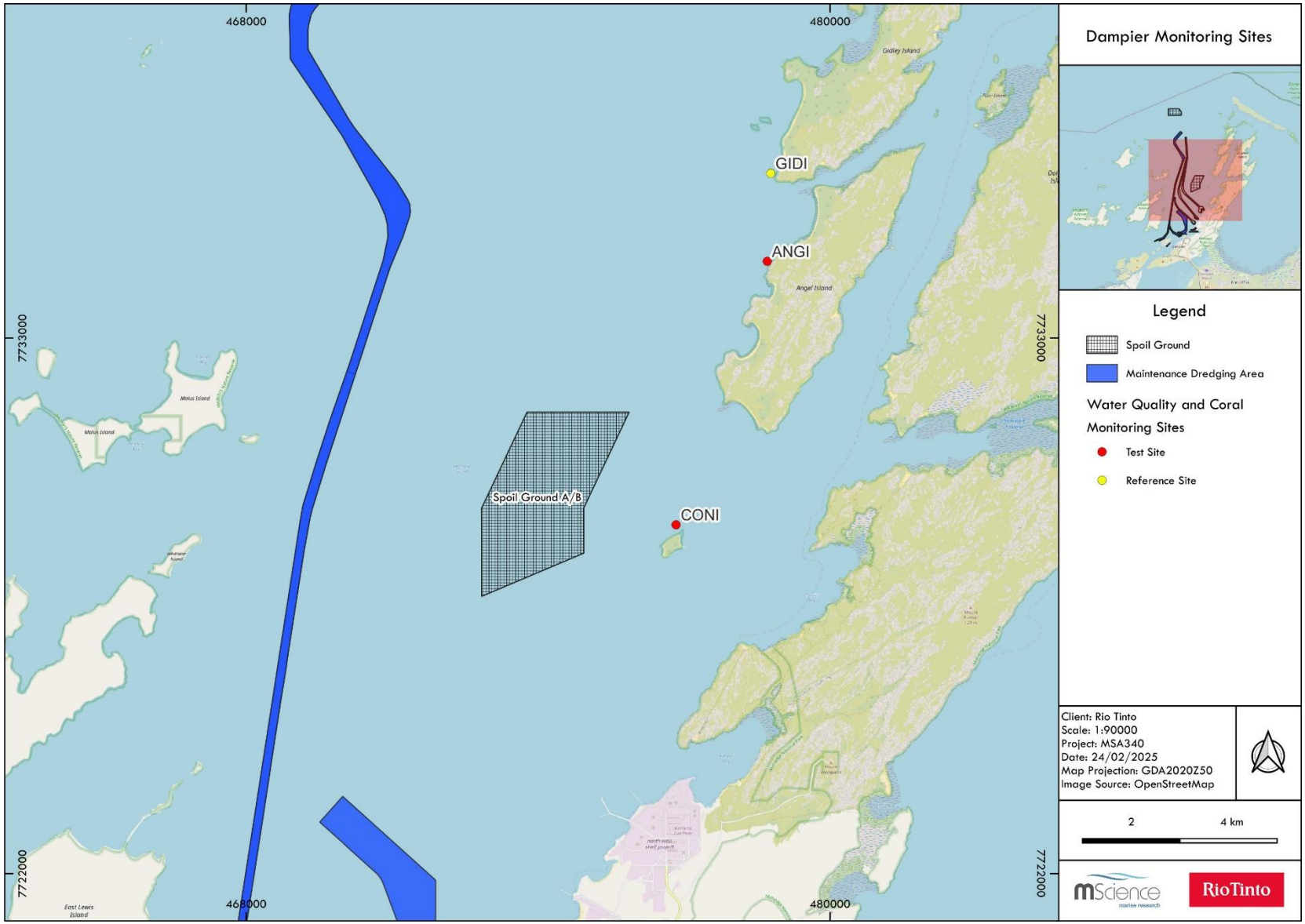

Figure 8-1. Water quality and coral monitoring site locations

8.1.5 Adaptive Management

The following management measures will be taken:

Running mean light levels below a Level 1 threshold:

- Will be reported to the RTIO Project Manager as soon as practical after it is confirmed;
- An investigation as to why the trigger was breached will be undertaken as soon as practical; and
- the RTIO Project Manager will discuss the implementation of potential measures to avoid recurrence with the Dredge Contractor.

Exceedance of a Level 2 trigger will require:

Running mean light levels below a Level 2 threshold:

- Will be reported to the RTIO Project Manager as soon as practical after it is confirmed and an investigation into why the breach occurred will be conducted.
- The Dredge Contractor will be required to amend dredging or disposal characteristics as soon as practical to allow the light levels to recover above the Level 2 threshold at the site where the Level 2 threshold was reached.
- Evidence of the success of those measures shall be taken to be a rise in the Daily Light Index above the relevant means in Table 8-1. Should that criterion not be met following the change in dredging/disposal, further changes will be sought until the criterion is met.
- Implementation of the benthic communities and habitat monitoring program outlined in Section 8.2.

As rolling means are subject to data averaged over a long period, light levels (DLI) for days at the end of the rolling period may already be above the rolling mean, indicating improving water quality. Where there is a clear trend to improving water quality, immediate management actions may be unnecessary.

Where the running mean of light levels continues to be below a threshold for consecutive days, it will be counted as one trigger event only (e.g. if a rolling 14 day threshold is reached on Day 15 as a result of a few very low light levels in days 8-9, light levels may continue to be below the threshold value for days 16 to 22 until there are sufficient new readings to average out the very low light levels recorded on days 8-9).

8.1.6 Reporting

During dredging, light data tested against triggers will be sent to RTIO daily as a record of progress. Note that until there are at least 7 days of data, triggers cannot be tested.

At the conclusion of a monitoring campaign, a report will be compiled which lists all recorded water quality data and any exceedances, and analyses data in the various intensity-duration categories used in recently published literature on the effects of dredging.

8.2 Benthic Communities and Habitats Monitoring

8.2.1 Rationale

While the risk assessment predicts a low risk to benthos from maintenance dredging activities, unexpected conditions may lead to excessive light reduction of sedimentation at sensitive receptor sites. Corals are the most sensitive biological receptor within the Port of Dampier. Water quality monitoring will determine the FID patterns of suspended sediment and impact on coral communities in proximity to the utilised spoil ground. Where water quality monitoring during a dredging campaign determines that as a result of dredged derived plumes light levels could occur at frequency-intensity-duration (FID) combinations which would cause mortality of nearby coral communities i.e. an exceedance of the water quality triggers is identified, or that excessive sedimentation may have occurred, monitoring of actual coral communities will be undertaken.

Coral surveys have been undertaken previously as part of works associated with the monitoring of dredging around the Port of Dampier. The results from the most recent (2024) survey of the proposed monitoring sites provide the initial baseline condition of coral density and other health indicators for these sites (MScience 2024). For each subsequent dredging campaign implemented under the approved SDP, the baseline condition of coral communities will be based on the results of the most recent pre-dredging (refer to Section 8.2.3) or contingency (refer to Section 8.2.6) survey implemented under this LTMMP.

8.2.2 Objectives

Key objectives for monitoring of coral communities in proximity to the utilised spoil grounds are to:

1. Check whether any exceedance of targets has impacted corals; and
2. Confirm the status of coral communities adjacent to disposal sites to determine what responses are appropriate to protecting them.

8.2.3 Timing

Pre-dredging surveys will be undertaken as close as practical before the start of each dredging campaign (weather permitting) proposed to last longer than seven days.

If an exceedance of the water quality management trigger outlined in Section 8.1.5 has been identified, surveys of benthic communities will be undertaken as soon as practical after the completion of dredging and disposal activities, weather permitting.

8.2.4 Methodology

Surveys will record representative images of the coral reef communities at receptor sites closest to spoil disposal and relevant reference sites. As per past coral health monitoring in Mermaid Sound, sampling procedures will follow that of Stoddart et al. (2005).

In-situ observations will be recorded, and images captured for later assessment of:

- Levels of cover of living organisms and the type of organisms present;
- The proportion of living versus 'dead-in-place' organisms;
- Levels of sediment cover on biota;
- The prevalence of bleaching within corals;
- Presence of mucus on sentinel corals such as *Porites*;
- Evidence of coral predator impacts or disease.

At least five transects of 10 m will be established at the relevant Test and Reference sites identified in Table 8-2and shown in Figure 8-1. Images will be collected along each transect. Observations (as above) and image assessments will be conducted by qualified marine scientists with experience in surveying coral reefs.

Following each survey, cover of benthos and the indicators of reef health listed above will be evaluated in a quantitative before-after-control-impact assessment to determine whether any observed stress or mortality was related to dredging activity.

This method has been shown to be capable of detecting a 10% decline in cover at sites with >80% power where the initial coral cover was 40% or more and 30 to 70% power at sites with lesser cover (Stoddart et al. 2005).

Where review of the pre-dredging survey data identifies coral cover at impact sites to be <5%, monitoring will be discontinued as cover will be too sparse to measure statistically for change.

8.2.5 Adaptive Management

If coral cover is >5% at impact sites and review of the post dredge monitoring data identifies a >10% loss of coral cover relative to reference sites, then a significant impact has occurred.

Should significant impacts on benthic communities be identified and assessed as due to the dredging activity an investigation would be undertaken and include:

- Evaluation of the local significance of the impact;
- Root cause assessment of the impact, including review of dredging activities and water quality monitoring;
- Assessment of how the LTMMP might be amended to avoid recurrence of such impacts in future maintenance dredging campaigns.

The LTMMP would be amended to reflect the above at the next review point.

8.2.6 Contingency Measures

The Proponent may choose to conduct a precautionary benthic habitat survey if there is a major thermal event identified over any summer or a major cyclone impacts the Port of Dampier area, or for some other reason.

8.2.7 Reporting

At the conclusion of monitoring, a report will be compiled which details the coral health monitoring program, including:

- A table of means and variance of live and dead coral cover at each site and the relative abundance of the major taxonomic groups.
- Results of any statistical analysis conducted.
- Other observations of divers carrying out the monitoring that are relevant to coral impacts as listed in Section 8.2.4.

9 ROLES AND RESPONSIBILITIES

The Proponent is ultimately responsible for the implementation of the LTMMP. The positions and responsibilities of key roles are presented in Table 9-1. Responsibilities of various roles are also listed in the tables of Sections 6 and 7.

Table 9-1. Roles and responsibilities

Position	Responsibilities
Proponent Project Manager	• Overall responsibility of the LTMMP. • Overall responsibility for compliance with statutory obligations. • Ensure dredging and disposal is conducted safely and in accordance with the LTMMP.
Dredge Contractor Project Manager	• Prepares and implements an Environment Management Plan (EMP) in accordance with this LTMMP and Pilbara Ports EMP. • Implements management actions. • Ensures staff have the correct training. • Ensures equipment is maintained.
Proponent Environmental Superintendent/Advisor	• Complies with the requirements of this LTMMP. • Oversees implementation of environmental controls, monitoring programs, inspections and audits. • Oversees monitoring and compliance reporting. • Provides advice on environmental issues as required.
Proponent Environmental Approvals Principal/Advisor	• Liaises with the DCCEEW on matters pertaining to the SDP/LTMMP. • Obtains approvals from the DCCEEW for any necessary variations or amendments of the SDP/LTMMP.
All personnel involved in maintenance dredging campaigns	• Complies with this LTMMP and other legal requirements. • Exercise a Duty of Care to the environment. • Report all environmental incidents.

10 REPORTING

Table 10-1 summarises the reporting requirements pre, post and during dredging works under the LTMMP/SDP that will form audit criteria.

Table 10-1. Summary of reporting

Report	Details	Frequency/ schedule	Prepared by	Submitted to
General				
Sea Dumping Permit International Reporting Requirements	To facilitate reporting to the International Maritime Organisation	• Annual • On expiry of SDP	Proponent	DCCEEW
Dampier TACC Report	Performance of the dredging operations against requirements of the LTMMP and SDP	At a TACC meeting for each year in which dredging occurs	Proponent	Dampier TACC (and Pilbara Ports)
Specific to Management of Marine Water Quality				
Water Quality Monitoring Report	Results of monitoring and management actions taken. Including trigger exceedances	• Final report within three months after completion of each dredging campaign >7 days in length. • Exceedance reporting is reactive	Environmental contractor	DCCEEW (and Pilbara Ports)
Hydrocarbon Spill Report	Incident report on hydrocarbon spill to marine waters including response measure implemented	Per occasion	Proponent	DWER (under Dampier Environmental Licence requirements) Pilbara Ports (immediately) DCCEEW
Specific to Management of Benthic Communities and Habitats				
BPPH Report	Results of the pre- and post-dredging (if required) BPPH monitoring survey.	Final report three months after completion of each dredging campaign >7 days in length.	Environmental contractor	DCCEEW (and Pilbara Ports)

Report	Details	Frequency/ schedule	Prepared by	Submitted to
Specific to Management of Dredge Spoil				
Bathymetric Survey Report	Results of pre- and post-bathymetric surveys of spoil grounds	Report within two months of completing the post dredging hydrographic survey	Hydrographic surveyor	Pilbara Ports DCCEEW
Plotting Sheets	Time/date and GPS position of each dumping run	On completion of the project or on request	Dredge contractor	Proponent
Specific to Management of Marine Fauna				
Marine Fauna Incident Report	Details of incident	Within 48 hours of incident	Dredge contractor	DCCEEW DPIRD
Marine Fauna sighting Reports	Record of marine fauna observations	Updated for every observation	Dredge contractor	Internal
Specific to Management of Introduced Marine Species				
Introduced Marine Pest Reports	Vessel Inspections reports and identification notifications	Notification: within 24 hours Vessel Inspection Checklist: 72 hours Inspection Report: within 3 weeks	Dredge contractor	DPIRD (and Pilbara Ports)

11 DELIVERABLE ACTIONS

Table 11-1 summarises the deliverable actions pre, post and during dredging works under the LTMMP/SDP.

Table 11-1. Deliverable actions

Action	Reference section of LTMMP	Where	Who	When
Overall				
Audit of the LTMMP	1.5.1	Not applicable	Rio Tinto Project Manager	Audit schedule will be developed based on the conditions/obligations contained within the SDP
Review of the LTMMP	1.5.2	Not applicable	Rio Tinto Project Manager	Following issue of the SDP and In response to any potential significant alteration of the environment in which dredging occurs
Per Campaign - Pre-dredging				
Dredging contract contains provisions for compliance with LTMMP	Not applicable	Not applicable	Rio Tinto Project Manager	Contract in place prior to commencement of each dredging campaign
Sediment SAP Implementation	3.5	SAP	Environmental contractor (arranged by RTIO Project Manager)	Once during the life of the LTMMP/SDP, prior to November 2029
Bathymetric Survey	7.3	Spoil ground proposed for dredging campaign	Hydrographic surveyor (arranged by RTIO Project Manager)	Complete prior to commencement of each dredging campaign
Vessel Inspections	6.4	Port of departure before arrival in Port of Dampier	Dredge contractor	Complete prior to vessel arrival within Port of Dampier limits
Benthic Habitat Monitoring Program	8.2	Monitoring sites listed in Table 8-2	Environmental contractor (arranged by RTIO Project Manager)	Complete prior to commencement of each dredging campaign expected to last longer than 7 days.

Action	Reference section of LTMMP	Where	Who	When
Per Campaign - Dredging				
Vessel in correct location	7.3	Within approved dredge footprint or spoil ground	Dredge contractor	During dredging and disposal activities
Turbidity controls in place and functional	6.2	On vessel	Dredge contractor	During dredging and disposal activities
Turtle exclusion devices fitted and working	6.1	On vessel	Dredge contractor	During dredging and disposal activities
Soft start of pumps	6.1	On vessel	Dredge contractor	During dredging and disposal activities
Marine Fauna Monitoring	6.1	At spoil ground proposed for campaign	Dredge contractor	During disposal activities
Water Quality Monitoring Program	8.1	Monitoring sites listed in Table 8-2	Environmental contractor (arranged by RTIO Project Manager)	Throughout each dredging campaign lasting longer than 7 days.
Per Campaign - Post-dredging				
Bathymetric Survey	7.3	Spoil ground proposed for campaign	Hydrographic surveyor (arranged by RTIO Project Manager)	One month post dredging
Water Quality Monitoring Program	8.1	Monitoring sites listed in Table 8-2	Environmental contractor (arranged by RTIO Project Manager)	Continue 7 days post-dredging for each campaign lasting longer than 7 days.
Benthic Habitat Monitoring Program	8.2	Monitoring sites listed in Table 8-2	Environmental contractor (arranged by RTIO Project Manager)	In the event of a water quality exceedance during a dredging campaign lasting longer than 7 days.

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APPENDIX A – RIO TINTO HSES&C POLICY

RioTinto

Heath, Safety, Environment, Security and Communities Policy

HSE-A-001

Group:	**Function:**	**No. of Pages:**
Policy	HSESC	2
Approved:	**Effective:**	**Auditable From:**
April 2024	April 2024	October 2024
Supersedes: HSEC Policy – January 2018		
Owner:	**Approver:**	**Target Audience:**
Head of HSES	Chief Executive, Australia	All Rio Tinto employees and external stakeholders.

Direct linkages to other relevant policies, standards, procedures or guidance notes:

- Our Code of Conduct - The Way We Work
- HSESC Management System and Performance Standards

Document purpose:

The global HSESC policy embodies Rio Tinto's unified approach, aligning with Group objectives and commitments. As a formal statement of business intent, it supports how we conduct our business across diverse operations. It serves as a guide to uphold consistent practices, mitigate risks, and handle significant impacts, supporting the company's overall performance and responsibilities.

RioTinto

Policy statement

Effective from April 2024

Health, Safety, Environment, Security and Communities

We're committed to delivering leading performance in health, safety, environment, security, communities, and human rights, as outlined in our code of conduct, "The way we work". This is the foundation for our social licence, to become the best partner we can be for our employees, customers, suppliers, service providers, host countries and communities.

Nothing is more important than the health, safety and wellbeing of our employees, contractors, and the communities where we operate. We are dedicated to working together to create a physically and psychologically healthy and safe workplace for everyone.

We recognise the responsibility we are entrusted with and see ourselves as stewards of natural resources, including air, land and water, and the ecosystems they support. We aim to identify, assess and proactively manage HSESC risks, by developing and implementing plans and controls to prevent, minimise, mitigate, and remediate impacts of our operations on people and the environment.

Through proactive monitoring and securing of our operations, we're continuing to find better ways to minimise disruptions during unplanned events, while protecting people, assets, and reputation.

We strive to develop lasting relationships with communities and Indigenous Peoples by working together, learning about, and supporting their goals and aspirations, avoiding, or mitigating adverse impacts, and respecting their rights, culture, and heritage. We do this by engaging thoughtfully and authentically and forming genuine partnerships to deliver positive social outcomes. We support local businesses, employ local people, and buy local products or services to contribute to strong and resilient communities and thriving regional economies.

Our leaders, employees and contractors have a shared responsibility to prioritise ethics and transparency and build trust. We work responsibly and honour the commitments we make. We comply with relevant laws and regulations where we operate and, where these differ from commitments set out in our Policies and Standards, we follow the higher standard wherever possible.

We establish measurable objectives and targets for improving performance and provide the resources needed to meet our performance objectives. We support and encourage continual improvement by identifying, developing, and implementing better ways of working through the application of our Group-wide standards. Importantly, we have the courage and commitment to do what is right, not what is easiest.

APPENDIX B – EPBC PROTECTED MATTERS DATABASE SEARCH RESULTS

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 09-Jul-2025

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	46
Listed Migratory Species:	72

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	65
Commonwealth Heritage Places:	None
Listed Marine Species:	113
Whales and Other Cetaceans:	16
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

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

State and Territory Reserves:	8
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	44
Key Ecological Features (Marine):	None
Biologically Important Areas:	25
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Indigenous			
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place	In feature area

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In feature area
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Arenaria interpres			
Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris			
Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat likely to occur within area	In feature area
Pluvialis squatarola Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]	Vulnerable	Breeding known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
Xenus cinereus Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Macroderma gigas](#) Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Orcaella heinsohni](#) Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Rhinonicteris aurantia (Pilbara form)](#) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area	In feature area
[Sousa sahulensis](#) Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
[Aipysurus apraefrontalis](#) Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
[Aipysurus foliosquama](#) Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In feature area
[Liasis olivaceus barroni](#) Pilbara Olive Python [66699]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
SHARK			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis clavata			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna pacifica			
Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]	Vulnerable	Breeding known to occur within area	In feature area
Migratory Marine Species			
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat likely to occur within area	In feature area
Carcharias taurus Grey Nurse Shark [64469]		Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In feature area
Isurus oxyrinchus Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area	In buffer area only
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tursiops aduncus (Arafura/Timor Sea populations)](#)			
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
Migratory Terrestrial Species			
[Hirundo rustica](#)			
Barn Swallow [662]		Species or species habitat may occur within area	In feature area
[Motacilla cinerea](#)			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
[Motacilla flava](#)			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#)			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Arenaria interpres](#)			
Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#)			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris alba](#)			
Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#)			
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#)			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#)			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Numenius phaeopus](#) Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area	In feature area
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Thalasseus bergii](#) Greater Crested Tern [83000]		Breeding known to occur within area	In feature area
[Tringa brevipes](#) Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In feature area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
[Tringa totanus](#) Common Redshank, Redshank [835]		Species or species habitat known to occur within area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - KARRATHA TRAINING DEPOT [50200]	WA	In buffer area only
Defence - KARRATHA TRAINING DEPOT [50238]	WA	In buffer area only
Defence - KARRATHA TRAINING DEPOT [50237]	WA	In buffer area only
Unknown		
Commonwealth Land - [51596]	WA	In buffer area only
Commonwealth Land - [51595]	WA	In buffer area only
Commonwealth Land - [51594]	WA	In buffer area only
Commonwealth Land - [50974]	WA	In buffer area only
Commonwealth Land - [51589]	WA	In buffer area only
Commonwealth Land - [51588]	WA	In buffer area only
Commonwealth Land - [50977]	WA	In buffer area only
Commonwealth Land - [51571]	WA	In buffer area only
Commonwealth Land - [50975]	WA	In buffer area only
Commonwealth Land - [50978]	WA	In buffer area only
Commonwealth Land - [50976]	WA	In buffer area only
Commonwealth Land - [51598]	WA	In buffer area only
Commonwealth Land - [51393]	WA	In buffer area only
Commonwealth Land - [51570]	WA	In buffer area only
Commonwealth Land - [52220]	WA	In buffer area only
Commonwealth Land - [51576]	WA	In buffer area only
Commonwealth Land - [51599]	WA	In buffer area only
Commonwealth Land - [51590]	WA	In buffer area only
Commonwealth Land - [51591]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51592]	WA	In buffer area only
Commonwealth Land - [51593]	WA	In buffer area only
Commonwealth Land - [51597]	WA	In buffer area only
Commonwealth Land - [51552]	WA	In buffer area only
Commonwealth Land - [51553]	WA	In buffer area only
Commonwealth Land - [51577]	WA	In buffer area only
Commonwealth Land - [51556]	WA	In buffer area only
Commonwealth Land - [51557]	WA	In buffer area only
Commonwealth Land - [51554]	WA	In buffer area only
Commonwealth Land - [51555]	WA	In buffer area only
Commonwealth Land - [51561]	WA	In buffer area only
Commonwealth Land - [51558]	WA	In buffer area only
Commonwealth Land - [51568]	WA	In buffer area only
Commonwealth Land - [51559]	WA	In buffer area only
Commonwealth Land - [51569]	WA	In buffer area only
Commonwealth Land - [51934]	WA	In buffer area only
Commonwealth Land - [51935]	WA	In buffer area only
Commonwealth Land - [52131]	WA	In buffer area only
Commonwealth Land - [51582]	WA	In buffer area only
Commonwealth Land - [51574]	WA	In buffer area only
Commonwealth Land - [51600]	WA	In buffer area only
Commonwealth Land - [51578]	WA	In buffer area only
Commonwealth Land - [51579]	WA	In buffer area only
Commonwealth Land - [51428]	WA	In buffer area only
Commonwealth Land - [51575]	WA	In buffer area only
Commonwealth Land - [51572]	WA	In buffer area only
Commonwealth Land - [51560]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51563]	WA	In buffer area only
Commonwealth Land - [51562]	WA	In buffer area only
Commonwealth Land - [51565]	WA	In buffer area only
Commonwealth Land - [51564]	WA	In buffer area only
Commonwealth Land - [51567]	WA	In buffer area only
Commonwealth Land - [51566]	WA	In buffer area only
Commonwealth Land - [51584]	WA	In buffer area only
Commonwealth Land - [51585]	WA	In buffer area only
Commonwealth Land - [51601]	WA	In buffer area only
Commonwealth Land - [51583]	WA	In buffer area only
Commonwealth Land - [51573]	WA	In buffer area only
Commonwealth Land - [52205]	WA	In buffer area only
Commonwealth Land - [51586]	WA	In buffer area only
Commonwealth Land - [51587]	WA	In buffer area only
Commonwealth Land - [51581]	WA	In buffer area only
Commonwealth Land - [51580]	WA	In buffer area only

Listed Marine Species

[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Ardenna pacifica as Puffinus pacificus](#) Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In feature area
[Arenaria interpres](#) Ruddy Turnstone [872]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Bubulcus ibis as Ardea ibis](#) Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area overfly marine area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area	In feature area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]	Vulnerable	Breeding known to occur within area	In feature area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area	In buffer area only
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In feature area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Xenus cinereus](#) Terek Sandpiper [59300]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
[Acentronura larsonae](#) Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area	In buffer area only
[Bulbonaricus brauni](#) Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area	In feature area
[Campichthys tricarinatus](#) Three-keel Pipefish [66192]		Species or species habitat may occur within area	In feature area
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In feature area
[Choeroichthys latispinosus](#) Muiron Island Pipefish [66196]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area
[Doryrhamphus dactyliophorus](#) Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus janssi](#) Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In feature area
[Doryrhamphus multiannulatus](#) Many-banded Pipefish [66717]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus negrosensis](#) Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In feature area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area	In feature area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In feature area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In feature area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In feature area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In feature area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In feature area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area	In buffer area only
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In feature area
Mammal			
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In feature area
Reptile			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Aipysurus duboisii Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In feature area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area	In feature area
Aipysurus mosaicus as Aipysurus eydouxii Mosaic Sea Snake [87261]		Species or species habitat may occur within area	In feature area
Aipysurus tenuis Brown-lined Sea Snake, Mjoberg's Sea Snake [1121]		Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In feature area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat may occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In feature area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area	In feature area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In feature area
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area	In feature area
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area	In feature area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In feature area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area	In feature area
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area	In feature area
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area	In feature area
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area	In feature area
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In feature area
Orcaella heinsohni Australian Snubfin Dolphin [81322]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Sousa sahulensis Australian Humpback Dolphin [87942]	Vulnerable	Species or species habitat known to occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Australian Marine Parks		[Resource Information]
Park Name	Zone & IUCN Categories	Buffer Status
Dampier	Habitat Protection Zone (IUCN IV)	In buffer area only

Habitat Critical to the Survival of Marine Turtles			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
All year (Jun - Aug)			
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In feature area
Oct - Feb			
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur	In feature area
Oct - Mar			
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Murujuga	National Park	WA	In feature area
Murujuga	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA36907	5(1)(h) Reserve	WA	In feature area
Unnamed WA36909	5(1)(h) Reserve	WA	In feature area
Unnamed WA36910	5(1)(h) Reserve	WA	In feature area
Unnamed WA36915	Nature Reserve	WA	In feature area
Unnamed WA38287	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA40877	5(1)(h) Reserve	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Burrup Common User Transmission Infrastructure	2022/09407		Post-Approval	In feature area
Burrup Peninsula Seawater Supply Scheme Upgrade	2023/09698		Completed	In feature area
Dampier Cargo Wharf Extension and Landside Redevelopment Project	2022/09237		Post-Approval	In feature area
Dampier Seawater Desalination Plant	2022/09395		Completed	In feature area
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335		Approval	In feature area
Woodside Solar Facility	2022/09328		Assessment	In buffer area only
Controlled action				
Ammonium Nitrate Project	2010/5423	Controlled Action	Completed	In buffer area only
Burrup North East Sand Mining Project	2008/4611	Controlled Action	Completed	In buffer area only
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed	In feature area
Duplication of the Dampier Highway Stages 2 & 6	2010/5419	Controlled Action	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
North West Shelf Gas Venture Phase VI Expansion	2007/3436	Controlled Action	Referral Decision	In feature area
Perdaman Urea Project, near Karratha, WA	2018/8383	Controlled Action	Post-Approval	In feature area
Pluto Gas Project	2005/2258	Controlled Action	Completed	In feature area
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval	In feature area
Proposed technical ammonium nitrate production facility	2008/4546	Controlled Action	Post-Approval	In buffer area only
site preparations	2005/2391	Controlled Action	Post-Approval	In feature area
Widening and resurfacing two principal roads servicing the Dampier Port Authori	2010/5677	Controlled Action	Completed	In feature area
Not controlled action				
Ammonia Plant	2001/199	Not Controlled Action	Completed	In buffer area only
Construction of Loadout Facility and Laydown Area	2002/598	Not Controlled Action	Completed	In feature area
Deep Gorge Boardwalk, Murujuga National Park, WA	2018/8283	Not Controlled Action	Completed	In buffer area only
Development of Industrial Land, Port of Dampier	2003/1293	Not Controlled Action	Completed	In feature area
Dimethyl ether plant	2001/509	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
King Bay East Rock Quarry & Industrial Estate Development	2003/1150	Not Controlled Action	Completed	In buffer area only
Methanol manufacturing	2001/528	Not Controlled Action	Completed	In buffer area only
Methanol plant	2001/521	Not Controlled Action	Completed	In buffer area only
Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA	2014/7160	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Pluto-North West Shelf Interconnector, Burrup Peninsula, WA	2018/8353	Not Controlled Action	Completed	In buffer area only
Port Expansion and Dredging	2003/1265	Not Controlled Action	Completed	In feature area
Stages 1 & 2 Port of Dampier Security Upgrade & Associated Works	2004/1751	Not Controlled Action	Completed	In feature area
Widening of MOF Road	2005/2305	Not Controlled Action	Completed	In feature area
Woodside Project Facilities Increase	2006/3191	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Algae Farm and Processing Facilities	2012/6596	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Ammonia Plant, Murujuga Burrup Peninsula - Renewable Hydrogen Project	2020/8739	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Dampier Marine Services Facility including 300m Wharf and Dredging Works	2009/5108	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Diesel Fuel Bunker Operation	2012/6289	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
MOF Road Widening and Resurfacing Works	2011/5843	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Nickol Bay Quarry Eastern Extension Proposal, Burrup Peninsula, WA	2013/6915	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Stag 4D & Reindeer MAZ Marine Seismic Surveys, WA	2013/7080	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
The Dampier Heavy Load Out Facility Berth and Swing Basin Expansion	2012/6271	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Referral decision				
construction of a new loadout facility and associated laydown area south of the	2002/579	Referral Decision	Completed	In feature area
Relocation of 2 heritage sites to National Heritage Place	2010/5709	Referral Decision	Completed	In buffer area only

Biologically Important Areas			[Resource Information]
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur	In feature area
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur	In feature area
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur	In feature area
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur	In feature area
Chelonia mydas Green Turtle [1765]	Mating	Known to occur	In feature area
Chelonia mydas Green Turtle [1765]	Migration corridor	Known to occur	In feature area
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Known to occur	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Migration corridor	Known to occur	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Mating	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Migration corridor	Known to occur	In feature area
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In feature area
Seabirds			
Ardenna tenuirostris Short-tailed Shearwater [84292]	Breeding	Known to occur	In feature area
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur	In feature area
Sharks			
Rhincodon typus Whale Shark [66680]	Foraging	Known to occur	In buffer area only
Whales			
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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APPENDIX C – LIKELIHOOD OF OCCURRENCE ASSESSMENT

EPBC Act 1999 Key			
Status		Presence Rank	
CE	Critically Endangered	**M**	May Occur
E	Endangered	**L**	Likely to Occur
V	Vulnerable	**K**	Known to Occur
MI	Migratory	**B**	Breeding
CD	Conservation Dependent	**SH**	Species or Species Habitat

BC Act 2016 Key			
EX	Presumed Extinct	**OS**	Other Specially Protected
CR	Critically Endangered	**P1**	Priority 1
EN	Endangered	**P2**	Priority 2
VU	Vulnerable	**P3**	Priority 3
IA	Migratory birds protected under international agreement	**P4**	Priority 4
CD	Conservation Dependent		

Likelihood	Definition
Rare (R)	The species has not been recorded within the defined search area. No suitable habitat is present within the defined search area.
Unlikely (U)	The species has not been recorded within the defined search area. The current known distribution of the species does not overlap the defined search area, however, there is low presence of low value suitable habitat i.e. not suitable for either breeding, foraging, resting and/or migration.
Possible (P)	The species has not been recorded within the defined search area. However, the species preferred habitat is known to occur within the defined search area and is of moderate value i.e. disturbed breeding conditions, constrained foraging, resting and/or migration habitat OR The species has been recorded within the defined search area. However, there is low presence of low value suitable habitat i.e. not suitable for either breeding, foraging, resting and/or migration.
Likely (L)	The species has been recorded within the defined search area. The species preferred habitat is known to occur within the defined search area and is of moderate value i.e. disturbed breeding conditions, constrained foraging, resting and/or migration habitat
Almost Certain (AC)	The species has been frequently recorded within the defined search area. The species preferred habitat is known to occur within the defined search area and is of high value i.e. important breeding, foraging, resting and/or migration habitat.

*Preferred habitat / description sourced from DCCEEW Species Profile and Threats (SPRAT) Database (DCCEEW 2023) unless otherwise denoted

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Seabirds						
Southern Giant-Petrel *Macronectes giganteus*	E, MI	SH - M	IA	The Southern Giant-Petrel is a marine bird that occurs in Antarctic to subtropical waters. In summer it mainly occurs over Antarctic waters.	**Rare** – Not expected based on lack of breeding within Australia and pelagic nature of the species.	**Unlikely** - May fly through and/or forage within the area, but large numbers not expected.
Australian Fairy Tern *Sternula nereis nereis*	V	B - K	VU	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation (Higgins and Davies 1996). The species nest in clear view of the water and on sites where the substrate is sandy and the vegetation sparse. Colonies tend to occupy areas rather than specific sites, and nest sites are often abandoned after one year, regardless of success. The species is known to breed on several islands in the Dampier Archipelago, the closest to the Project area being ~21 km away at Elphick Nob on Quartermaine Island (CALM 1990)	**Unlikely** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.	**Almost Certain** – Expected to occur during breeding season (Aug to Nov), given known breeding on islands and overlapping designated breeding BIA
Common Noddy *Anous stolidus*	MI	SH - M	IA	In Australia, the Common Noddy occurs mainly in the ocean off the Queensland coast. During the breeding season, the Common Noddy usually nests on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters. Birds may nest in bushes, saltbush, or other low vegetation. During the non-	**Unlikely** - Not known to breed in the area. Pelagic when not breeding. May fly over but the area is not expected to represent significant foraging habitat.	**Unlikely** – May fly through and/or forage but not known to breed in the area.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				breeding period, the species occurs in groups throughout the pelagic zone.		
Fork-tailed Swift *Apus pacificus*	MI	SH - L	IA	The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. *Apus pacificus subsp. pacificus* is the only subspecies to migrate to Australia.	**Unlikely** - May fly over the area but unlikely to land	**Unlikely** - May fly over the area but unlikely to land
Wedge-tailed Shearwater *Ardenna pacifica*	MI	B - K	MI	The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. The species breeds throughout its known range, mainly on vegetated islands, atolls and cays. In the north west of Australia the Wedge-tailed Shearwater breeds in October/November. The species is known to breed on several islands in the Dampier Archipelago, the closest to the Project area being ~12 km away at Conzinc Island (CALM 1990).The Islands of the Dampier Archipelago have been identified as a BIA for the species.	**Possible** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat – no breeding.	**Almost Certain** – Expected to occur during breeding season (Sep to Apr), given known breeding on islands and overlapping designated breeding BIA
Streaked Shearwater *Calonectris leucomelas*	MI	SH - M	-	The Streaked Shearwater breeds on islands off Japan, Korea and China. The species is an uncommon visitor to Pilbara seas between March and May (Johnstone et al. 2013).	**Rare** – Not expected based on lack of breeding within Australia and pelagic nature of the species.	**Unlikely** - May fly through and/or forage but not known to breed in Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Lesser Frigatebird *Fregata ariel*	MI	SH - K	IA	The Lessor Frigatebird is known to occur in the Dampier Archipelago, however no breeding has been recorded (Johnstone et al. 2013)	**Unlikely** - May fly over but the area is not expected to represent significant foraging habitat.	**Unlikely** – May fly through and/or forage but not known to breed in the area.
Caspian Tern *Hydroprogne caspia*	MI	B - K	MI	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. Their distribution is widespread in coastal regions of Western Australia (Higgins and Davies 1996) and they are known to breed on numerous islands in the Dampier Archipelago, the closest to the Project area being ~12 km away at Conzinc Island (CALM 1990).	**Possible** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat – no breeding.	**Almost Certain** – Expected to occur during breeding season (Jul to Oct), given known breeding on islands.
Bridled Tern *Onychoprion anaethetus*	MI	B - K	MI	Bridled Terns occupy tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks. In Western Australia, breeding is widespread and is known to occur on numerous islands in the north of the Dampier Archipelago, with foraging taking place well offshore (Johnstone et al. 2013). The species forages in offshore, continental shelf waters and is only rarely recorded along mainland coasts, even those adjacent or close to breeding colonies.	**Unlikely** - May fly over but the area is not expected to represent significant foraging habitat.	**Likely** – breeding is known to occur on islands in the north of the Dampier Archipelago
White-tailed Tropicbird *Phaethon lepturus*	MI	SH - M	-	At the species level, the White-tailed Tropicbird occupies marine habitats in tropical waters with sea-surface temperatures of more than 22°C. The tropicbird breeds on islands and atolls, where it nests in a variety of habitats	**Rare** – Not expected based on lack of breeding on mainland	**Rare** – Not expected based on lack of breeding on mainland

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				including on bare sandy ground, in closed-canopy rainforest, on rocky cliffs and in quarries. In Australia, the White-tailed Tropicbird nests in Pisonia trees amongst Pisonia-coconut vegetation, and on sandy ground. The species breeds in the Cocos-Keeling Islands, Ashmore Reef and Rowley Shoals. In Australian waters they are probably pelagic, as they are rarely found inshore.	Australia and pelagic nature of the species.	Australia and pelagic nature of the species.
Roseate Tern *Sterna dougallii*	MI	B - L	IA	The Roseate Tern occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. Birds rarely occur in inshore waters or near the mainland. The Roseate Tern is usually associated with coral reefs, where foraging may occur along the seaward margin, within reef lagoons, or over the reef itself. The species may also forage around islands on the continental shelf, either in lagoons or offshore. They are rarely recorded foraging in shallow sheltered inshore waters.	**Unlikely** - May fly through but the area is not expected to represent significant foraging habitat – no breeding.	**Almost Certain** – Expected to occur during breeding season (Aug to Dec), given known breeding on islands and overlapping designated breeding BIA
Little Tern *Stemula albifrons*	MI	SH - M	MI	In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. In north-western Western Australia (from Broome to the Northern Territory), known breeding colonies are small, apparently <20 pairs, but counts of hundreds of non-breeding birds have been made. Non-breeding birds, of the Australian subpopulations and of extralimital populations, extend farther	**Possible** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat – no breeding.	**Possible** - May be found occasionally feeding but the area is not expected to represent significant foraging habitat – no breeding.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				around the Australian coast than known breeding colonies, as well as overlapping extensively with the Australian breeding range. In Western Australia, the species regularly occurs south to approximately 20° S, with occasional records south of there (for example, Shark Bay).		
Greater Crested Tern *Thalasseus bergii*	MI	B - K	MI	This large tern is predominantly found offshore and coastal, on beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers. The Crested Tern is usually a strictly coastal species, though there are occasional records in the arid interior of Australia, where birds were possibly blown by passing tropical cyclones.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Breeding may occur on some islands, but records are lacking
Shorebirds						
Red Knot *Calidris canutus*	E, MI	SH - K	EN	The Red Knot is common in all the main suitable habitats around the coast of Australia, as a non-breeding visitor. Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Curlew Sandpiper *Calidris ferruginea*	CE, MI	SH - K	CR	In Western Australia, the Curlew Sandpiper are widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division, but are more sparsely distributed between Carnarvon and Dampier Archipelago. They occur in	**Likely** – Suitable habitat located within	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				large numbers, in thousands to tens of thousands, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	and adjacent to the Project development	Australia. Dampier Saltworks identified as Important Bird Area for this species.
Great Knot *Calidris tenuirostris*	CE, MI	SH - K	CR	The Great Knot winters in Australia, occurring in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats, sandy spits and islets, muddy shorelines with mangroves and occasionally exposed reefs or rock platforms. It roosts in refuges such as shallow water in sheltered sites, on coastal dunes or on saltflats amongst mangroves during high tides.	**Unlikely** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Greater Sand Plover *Charadrius leschenaultii*	V, MI	SH - K	VU	This species inhabits littoral and estuarine habitats, sheltered sandy shelly or muddy beaches with large intertidal mudflats or sandbanks, and sandy estuarine lagoons, inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. Important areas of habitat in Western Australia include Eighty Mile Beach, Roebuck Bay and Ashmore Reef	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Lesser Sand Plover *Charadrius mongolus*	E, MI	SH - K	EN	This species occurs in littoral and estuarine environments, large intertidal sandflats or mudflats, sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. Important	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Western Australian sites include Eighty Mile Beach, Roebuck Bay, Broome and Port Hedland Saltworks.		breeding visitor to Australia.
Far Eastern Curlew *Numenius madagascariensis*	CE, MI	SH - K	CR	Within Australia, the eastern curlew has a primarily coastal distribution. They have a continuous distribution from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley and along the Northern Territory, Queensland, and NSW coasts and the islands of Torres Strait. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. The species does not breed in Australia.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Australian Painted Snipe *Rostratula australis*	E	SH - M	EN	The Australian Painted Snipe has been recorded at wetlands in all states of Australia. It is most common in eastern Australia, and has been recorded less frequently at a small number of scattered locations in South Australia, the Northern Territory and Western Australia. The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged	**Unlikely** - area is not expected to represent significant foraging habitat.	**Unlikely** - area is not expected to represent significant foraging habitat.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.		
Common Sandpiper *Actitis hypoleucos*	MI	SH - K	MI	The Common Sandpiper is widespread in small numbers utilising a wide range of coastal wetlands and some inland wetlands where it forages in muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. Areas of national importance within Western Australia include Nuytsland Nature Reserve and Roebuck Bay.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Marsh Sandpiper *Tringa stagnatilis*	MI	SH - K	MI	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. In Western Australia they are mainly found around the coast. The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. In Western Australia they prefer freshwater to marine environments. The species has been recorded roosting or loafing on tidal mudflats, near low saltmarsh, and around inland swamps.	**Unlikely** – may occur but in low numbers	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.
Common Greenshank *Tringa nebularia*	MI	SH - K	MI	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. It occurs around most of the WA coast from Cape Arid in the south to Carnarvon in the north-west. In the Kimberleys it is recorded in	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				the south-west and the north-east, with isolated records from the Bonaparte Archipelago. The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms.		breeding visitor to Australia.
Common Redshank *Tringa totanus*	MI	SH - K	MI	In Australia, the Common Redshank has been recorded at scattered locations. In WA, the species is regular and widespread in the north-west, from the Dampier salt fields to Roebuck Bay and Broome. The Common Redshank is found at sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms	**Unlikely** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.
Pacific Golden Plover *Pluvialis fulva*	MI	SH - K	MI	Within Australia, the Pacific Golden Plover is widespread in coastal regions. In Western Australia, the species is seldom recorded along the southern or south-western coasts, but is more widespread along the Pilbara and Kimberley coasts between North-West Cape and the Northern Territory border. The Pacific Golden Plover usually forages on sandy or muddy shores (including mudflats and sandflats) or margins of sheltered areas such as estuaries and lagoons, though it also feeds on rocky shores, islands or reefs. In addition, Pacific	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Golden Plovers occasionally forage among vegetation, such as saltmarsh, mangroves or in pasture or crops.		
Osprey *Pandion haliaetus*	MI	B - K	MI	The breeding range of the Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in WA to Lake Macquarie in NSW. The distribution of the species around the northern coast appears continuous except for a possible gap at Eighty Mile Beach. Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. Osprey breeds from April to February in Australia. Breeding seasons of individual pairs vary according to latitude, with breeding commencing progressively later on a cline from north to south	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Breeding may occur on some islands, but records are lacking
Grey-tailed Tattler *Tringa brevipes*	MI	SH - K	P4	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. The species is widespread from the Houtman Abrolhos Islands and the mainland adjacent to the Kimberley Division. The Grey-tailed Tattler is found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Also found on intertidal rocky, coral or stony reefs, platforms and islets that are exposed at low tide.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Ruddy Turnstone *Arenaria interpres*	MI	SH - K	MI	The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year, including from Tasmania in the south to Darwin in the north and many coastal areas in between. It is found in most coastal regions. The Ruddy Turnstone are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches. In the north, they are found in a wider range of habitats, including mudflats. The species roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Sharp-tailed Sandpiper *Calidris acuminata*	MI	SH - K	MI	The Sharp-tailed Sandpiper spends the non-breeding season in Australia. In WA, scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Pectoral Sandpiper *Calidris melanotos*	MI	SH - M	MI	In WA, the Pectoral Sandpiper is rarely recorded. Although it has been the Pilbara and the Kimberley (Higgins and Davies 1996). The species prefers shallow fresh to saline wetlands and can be found at coastal lagoons, estuaries, bays, swamps,	**Unlikely** – may occur but in low numbers	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.		
Oriental Pratincole *Glareola maldivarum*	MI	SH - K	MI	Within Australia the Oriental Pratincole is widespread in northern areas, especially along the coasts of the Pilbara Region and the Kimberley Division in WA. Eighty Mile Beach and Roebuck Plains are considered internationally and important sites. In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland. They often occur near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons.	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia. Dampier Saltworks identified as Important Bird Area for this species.
Broad-billed Sandpiper *Limicola falcinellus*	MI	SH - K	MI	In Australia, the Broad-billed Sandpiper is most common on the north and north-west coasts. In Western Australia they mostly occur on the coasts of the Pilbara and Kimberley between Onslow and Broome. The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms.	**Unlikely** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Asian Dowitcher *Limnodromus semipalmatus*	MI	SH - M	MI	The Asian Dowitcher is a regular visitor to the north-west between Port Hedland and Broome. Elsewhere they are sporadic and rare. The species occurs in sheltered coastal environments, such as embayments, coastal lagoons, estuaries	**Unlikely** – Not expected to occur, not	**Possible** – may occur foraging and roosting.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				and tidal creeks. They are known to frequent shallow water and exposed mudflats or sandflats. In Australia the Port Hedland Saltworks provides crucial habitat for the species. The species is commonly found in the round ponds and channels of saltworks and sewage farms.	identified in PMST report.	Non-breeding visitor to Australia.
Black-tailed Godwit *Limosa limosa*	MI	SH - K	MI	The Black-tailed Godwit is found in all states and territories of Australia, however, it prefers coastal regions and the largest populations are found on the north coast between Darwin and Weipa. It is generally found in small numbers elsewhere and there are scattered inland records. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide.	**Unlikely** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Red-necked Phalarope *Phalaropus lobatus*	MI	SH - K	MI	The Red-necked Phalarope is a regular at the Port Hedland Saltworks and Rottnest Island in Western Australia. During the non-breeding period the Red-necked Phalarope occurs mainly at sea.	**Unlikely** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.
Whimbrel *Numenius phaeopus*	MI	SH - K	MI	The Whimbrel is a regular migrant to Australia, with a primarily coastal distribution. In WA, it is common and widespread from Carnarvon to the north-east Kimberley Division. The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms.		
Sanderling *Calidris alba*	MI	SH - K	MI	Sanderlings occur on most of the coast from Eyre to Derby, and also around Wyndham. They are more often recorded on the south and southwest coasts, north to around southern Shark Bay, with more sparsely scattered records further north in Gascoyne and Pilbara Regions and the Kimberley Division. Small numbers regularly arrive during late August and early September in the south-west of Western Australia. They roost on/behind, bare sand high on the beach, clumps of washed-up kelp, coastal dunes and rocky reefs and ledges (Higgins and Davies 1996). The species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed.	**Unlikely** - area is not expected to represent significant foraging habitat.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Terek Sandpiper *Xenus cinereus*	MI	SH - K	-	In Australia, the Terek Sandpiper has a primarily coastal distribution. In WA, the species is rarely seen on the south coast but is widespread in the Pilbara region and Kimberley Division, from Dampier to Wyndham, with occasional records around Shark Bay. The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.).	**Unlikely** – Not expected to occur, not identified in PMST report.	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				Birds are seldom near the edge of water, however, birds may wade into the water.		
Oriental Plover *Charadrius veredus*	MI	SH - K	MI	The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia. Eighty Mile Beach, Port Hedland and Dampier Saltworks and Roebuck Bay are considered internationally important sites for the species. Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland.	**Unlikely** – may occur but in low numbers	**Possible** – may occur foraging and roosting. Non-breeding visitor to Australia.
Grey Plover *Pluvialis squatarola*	MI	SH – K	MI	There are no published estimates of the extent of occurrence of the Grey Plover in Australia. The species has been recorded in all states, where it is found along the coasts, and it especially abundant on the western and southern coastlines. In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons.	**Unlikely** – Not expected to occur, not identified in PMST report.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Red-necked Stint *Calidris ruficollis*	MI	SH – K	MI	During the non-breeding season, over 80% of the global population of the Red-necked Stint resides in Australia. The species is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats,	**Unlikely** - area is not expected to represent significant habitat.	**Likely** – expected to occur foraging and roosting. Non-

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. The Red-necked Stint roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation. In north Australia, adults start arriving from the third week of August and most arrive before the end of September, with arrival in southern Australia a couple of weeks later.		breeding visitor to Australia.
Long-toed Stint *Calidris subminuta*	MI	SH – K	MI	The Long-toed Stint is a regular summer visitor to Australia. In Western Australia the species is found mainly along the coast. It is widespread around the Pilbara region and the Kimberley Division between Karratha and Wyndham-Kununurra. The Long-toed Stint forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They occasionally feed on open water, well away from the shore; this is more common in drying ephemeral wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud.	**Unlikely** - area is not expected to represent significant habitat.	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.
Bar-tailed Godwit *Limosa lapponica*	MI	SH – K	MI	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. In Western Australia it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley Division. Eighty Mile Beach and Roebuck Plains are considered internationally and important sites. The Bar-tailed Godwit is found in coastal habitats, particularly large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. The	**Likely** – Suitable habitat located within and adjacent to the Project development	**Likely** – expected to occur foraging and roosting. Non-breeding visitor to Australia.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				species usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.		
Marine Mammals						
Blue Whale *Balaenoptera musculus*	E, MI	SH - L	EN	The blue whale is considered a cosmopolitan species and range from polar to tropical waters. Blue whales, and the pygmy subspecies (*B. m. brevicauda*) are known to aggregate and feed along the southern continental shelf in the Perth Canyon during Summer (Rennie et al. 2009), and migrate west and north along the Australian coast until they reach West Timor and Indonesia (Moller et al. 2020). General distribution of the species is typical in water depths over 200 m and commonly over 1000 m. In the wider region, pygmy blue whales migrate along the 500 m to 1000 m depth contour on the edge of the slope and are likely to feed opportunistically on ephemeral Krill aggregations. Recent satellite tracking analysis for the pygmy blue whale conducted by Thums et al. (2022) suggests important migration areas encompassed by the Migration BIA in Australia include a broader north-west distribution and migration extent than what was represented during the study. Most whales were found to migrate much further offshore along the north-west part of the Australian coast, even out to the abyssal plain.	**Rare** – Vey unlikely to frequent shallow nearshore waters in the vicinity of the Project development footprint	**Unlikely** - may be found in offshore waters considering BIA for the species overlaps the search area, however still not expected given water depths and known migration route.
Humpback Whale *Megaptera novaeangliae*	MI	SH - K	CD	The coastal area off Dampier is a known migratory path for Humpback Whales moving between their southern feeding grounds and northern breeding grounds. The north bound	**Unlikely** – given water depths	**Possible** –may occur migrating through waters of the outer islands of the Dampier

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				migration peaks adjacent to the Dampier area between approximately the last week of July and the first week of August. The peak of the south bound migration occurs during the last week in August and the first week of September. The Dampier region is not an aggregation or calving area for this species, although surveys indicate that Nickol Bay is used as a single day staging post, mainly by pods with calves using the areas close to shore during the southern migration (BMT Oceanica 2017).		Archipelago. Search area within migratory BIA for the species but large numbers of migrating individuals not expected.
Bryde's Whale *Balaenoptera edeni*	MI	SH - M	MI	Bryde's Whales are found year-round in waters between 40° S and 40° N, primarily in temperatures exceeding 16.3 °C. The coastal form of Bryde's Whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m). Bryde's whales have been recorded off-shore of Nickol Bay during summer months, most likely feeding (Jenner and Jenner 2009)	**Rare** – Vey unlikely to frequent shallow nearshore waters in the vicinity of the Project development footprint	**Unlikely** - may be found in offshore, however still not expected given water depths
Killer Whale *Orcinus orca*	MI	SH - M	MI	Killer Whales are cosmopolitan in distribution. The species distribution and occurrence in Australia strongly reflect locations of prey aggregation, particularly breeding and feeding grounds (Morrice 2004), such as those of the humpback whale (Pitman et al. 2015).	**Unlikely** – not expected to occur adjacent to the Project footprint given preference for deeper water.	**Possible** – may occur in deeper waters particularly during southern humpback whale migrations when hunting for calves.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Australian Humpback Dolphin *Sousa sahulensis*	MI	SH - K	P4	Australian Humpback Dolphins are found in tropical, shallow coastal waters and tend to occur in enclosed bays with mangrove forests and seagrass beds, but are also found in open coastal waters around islands and coastal cliffs in association with rock or coral reefs (SEWPaC 2012). In the north-west of Australia, the species has been recorded between Coral Bay and Roebuck Bay (Allen et al. 2012).	**Possible** - May be found in the area but visits will be brief due to port activity.	**Likely** – expected to occur in shallow nearshore waters within the Dampier Archipelago.
Indian Ocean / Spotted Bottlenose Dolphin *Tursiops aduncus*	MI	SH - L	MI	The Indian Ocean Bottlenose Dolphin tends to occur in deep, open coastal waters (up to 200 m deep), including coastal areas around oceanic islands (SEWPaC 2012), however the species has been recorded around the islands of the Dampier Archipelago (Allen et al. 2012).	**Possible** - May be found in the area but visits will be brief due to port activity.	**Likely** – expected to occur in shallow nearshore waters within the Dampier Archipelago.
Australian Snubfin Dolphin *Orcaella heinsohni*	MI	SH - L	MI, P4	Within Australia, Australian Snubfin Dolphins have been recorded almost exclusively in coastal and estuarine waters. The species has been found in the shallow coastal waters and estuaries along the Kimberley coast. Beagle and Pender Bays on the Dampier Peninsula and tidal creeks around Yampi Sound and between Kuri Bay and Cape Londonderry are important areas for Australian Snubfin Dolphins. Australian Snubfin Dolphins share similar habitat preferences with Indo-Pacific Humpback Dolphins. Feeding may occur in a variety of habitats, from mangroves to sandy bottom estuaries and embayments, to rock and/or coral reefs. Feeding primarily occurs in shallow waters (less than 20 m) close to river mouths and creeks.	**Possible** - May be found in the area but visits will be brief due to port activity.	**Likely** – expected to occur in shallow nearshore waters within the Dampier Archipelago.
Dugong	MI	SH - K	OS	Dugongs occur in coastal and island waters from Shark Bay in Western Australia across the northern coastline to Moreton	**Possible** - visits possible, but due to	**Likely** – expected to occur in areas of

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Dugong dugon				Bay in Queensland. Dugongs are seagrass community specialists and the range of the dugong is broadly coincident with the distribution of seagrasses in the tropical and sub-tropical waters in their Australian range.	lack of food source and port activity, visits would be brief and rare.	seagrass habitat within the Dampier Archipelago
Marine Reptiles						
Loggerhead Turtle *Caretta caretta*	E, MI	B - K	EN	Loggerhead turtles' nest on open, sandy beaches. Western Australia supports one genetic stock of loggerhead turtles with nesting encompassing the Gascoyne (Dirk Hartog Island) to Pilbara (Varanus Island) Regions (Limpus 2002). Foraging occurs in areas of seagrass beds and coral/rocky reefs	**Possible** – Search area within buffer of internesting BIA, however outside of the species key nesting range so no nesting/internesting expected.	**Likely** – foraging and migrating individuals expected to occur.
Green Turtle *Chelonia mydas*	V, MI	B - K	VU	Western Australia supports one genetic stock of green turtles nesting from the Gascoyne (Ningaloo Coast) to the Kimberley (Lacepede Islands) Regions (Limpus 2002). The Dampier Archipelago is a key nesting and interesting area for the species. Green Turtles spend their first five to ten years drifting on ocean currents. Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds (Limpus 2008b).	**Likely** - Foraging and migrating individuals expected to occur but in low numbers. Internesting and dispersing individuals not expected, given distance to nearest notable nesting beach (Enderby Island, 17 km).	**Almost Certain** – Edge of search area within known BIA for breeding, internesting, foraging, migrating and dispersing of the species.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Leatherback Turtle *Dermochelys coriacea*	E, MI	B - L	VU	There has been no confirmed breeding of leatherback turtles in Western Australia (Limpus 2009a). Foraging leatherback turtles from foreign rockeries e.g. Indonesia, pass through Western Australian waters.	**Unlikely** – due to absence of breeding areas and shallow waters.	**Possible** – Foraging and migrating individuals may occur.
Hawksbill Turtle *Eretmochelys imbricata*	V, MI	B - K	VU	Hawksbill Turtles are found in tropical, subtropical and temperate waters in all the oceans of the world. Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in Western Australia (Pendoley 2005). Hawksbill Turtles spend their first five to ten years drifting on ocean currents, Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat (Limpus 2009b).	**Likely** - Foraging and migrating individuals expected to occur but in low numbers. Internesting and dispersing individuals not expected, given distance to nearest notable nesting beach (Angel Island, 15 km).	**Almost Certain** – Edge of search area within known BIA for breeding, internesting, foraging, migrating and dispersing of the species.
Flatback Turtle *Natator depressus*	V, MI	B - K	VU	The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya (DCCEEW 2023). Nesting is confined to Australia and four genetic stocks are recognised (Limpus 2007). Adults inhabit soft bottom habitat over the continental shelf, Post-hatchling and juvenile Flatback Turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles.	**Likely** - Foraging and migrating individuals expected to occur in low numbers. Low numbers of internesting and dispersing individuals associated with low density nesting at EII may occur. Nearest notable nesting beaches are 17 km	**Almost Certain** – Edge of search area within known BIA for breeding, internesting, foraging, migrating and dispersing of the species.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
					from the development footprint (Dolphin and Enderby islands)	
Short-nosed Sea Snake *Aipysurus apraefrontalis*	CE	SH - L	CR	The Short-nosed Sea snake is endemic to Western Australia, and has been recorded from Exmouth Gulf, Western Australia to the reefs of the Sahul Shelf, in the eastern Indian Ocean. Most specimens have been collected from Ashmore and Hibernia Reefs (Guinea and Whiting 2005). The species prefers the reef flats or shallow waters along the outer reef edge in water depths to 10 m.	**Unlikely** – species not previously been recorded from the area. Suitable habitat is either small in area of of low value	**Possible** – suitable coral reef habitat for the species can be found around the islands of the Dampier Archipelago.
Leaf-scaled Sea Snake *Aipysurus foliosquama*	CE	SH - K	CR	Until recently breeding populations of the Leaf-scaled sea snake were only known from Ashmore and Hibernia Reefs in the Timor Sea, but the species has since been found during field surveys in the coastal waters of the Exmouth Gulf (Udyawer et al. 2020). The Leaf-scaled Sea snake occurs in shallow water (less than 10 m in depth), in the protected parts of the reef flat, adjacent to living coral and on coral substrates.	**Unlikely** – species not previously been recorded from the area. Suitable habitat is either small in area of low value	**Possible** – suitable coral reef habitat for the species can be found around the islands of the Dampier Archipelago.
Sharks and Rays						
Grey Nurse Shark (west coast population) *Carcharias taurus*	V	SH - L	VU	Grey nurse sharks have a broad inshore distribution and tend to be found in groups at specific aggregation sites around inshore rocky reefs or islands (Otway et al. 2003). Their distribution in Western Australia is largely confined to the south-west coastal waters (Commonwealth of Australia 2014)	**Unlikely** – not expected due to lack of suitable habitat, water depths and port activities	**Possible** – may be found within suitable habitat around the outer islands of the Dampier Archipelago.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				and there are no known aggregation sites in Western Australia (Chidlow et al. 2005)		
White Shark *Carcharodon carcharias*	V, MI	SH - M	VU	White sharks have a global marine distribution in temperate to tropical latitudes. In Western Australia they are most commonly found in continental shelf waters and around oceanic islands, and are present all year-round in the southwest of the state (McAuley et al. 2017).	**Unlikely** - not expected due to preference for temperate waters and lack of favoured prey.	**Unlikely** - not expected due to preference for temperate waters and lack of favoured prey.
Oceanic Whitetip Shark *Carcharhinus longimanus*	MI	SH - M	-	Oceanic Whitetip Sharks are found in pelagic waters throughout the topics and subtropics. Within Australian waters, it is found in from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney (Last and Stevens 2009)	**Unlikely** – Pelagic species, unlikely to frequent nearshore waters	**Possible** – may be found in deeper waters
Scalloped Hammerhead *Sphyrna lewini*	CD	SH - L	-	The Scalloped Hammerhead Shark is a coastal pelagic species with a circumglobal distribution in warm temperate and tropical coastal areas between 45°N and 34°S. They are known to form large migratory schools and in Australia tend to move south during the warmer months. Scalloped Hammerheads may be found throughout the seas around northern Australia as far south as Sydney NSW (34°S) and Geographe Bay WA (33°S). Adult Scalloped Hammerheads inhabit deep waters adjacent to continental shelves, in water depths ranging from the surface to at least 275 m in depth, while juveniles are found close to shore in nursery habitats. Adult females are	**Unlikely** – not expected given water depths	**Possible** – may be found in deeper waters

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				thought to occupy deeper water and move into shallower waters to mate and give birth.		
Whale Shark *Rhincodon typus*	V, MI	SH - M	OS	The whale shark is cosmopolitan in distribution, occurring in all tropical and warm temperate seas apart from the Mediterranean, and inhabits pelagic habitats (Colman 1997). In Western Australia, large numbers of whale sharks aggregate off Ningaloo Reef for several weeks between March and June every year. When sharks depart the Ningaloo Reef they travel northeast along the continental shelf before moving offshore into the northeastern Indian Ocean (Wilson et al. 2006).	**Unlikely** – not expected given water depths and absence of significant zooplankton populations	**Unlikely** – not expected absence of significant zooplankton populations
Dwarf Sawfish *Pristis clavata*	V, MI	SH - K	P1	The Dwarf Sawfish usually inhabits shallow (2–3 m) coastal waters and estuarine habitats, often influenced by large tides. Estuarine habitats are used as nursery areas by Dwarf Sawfish, with immature juveniles remaining in these areas up until three years of age. The majority of capture locations and donated rostra in Western Australia have been between King Sound and Cape Keraudren (Morgan et al. 2011)	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured
Green Sawfish *Pristis zijsron*	V	SH - K	VU	Green sawfish are currently distributed from about the Whitsundays in Queensland across northern Australian waters to Shark Bay in Western Australia and inhabit inshore shallow marine waters. The green sawfish has been recorded in estuaries, river mouths, embankments and along sandy and muddy beaches. The green sawfish has been confirmed through sightings or evidence of rostra in the Karratha area (Morgan et al. 2019; Morgan et al. 2011). Green Sawfish generally have a	**Possible** - Brief visits possible in areas of suitable habitat, but likely to avoid areas of high vessel traffic	**Likely** – species known to occur within areas of suitable habitat.

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
				very small home range, occupy very shallow waters and are likely to avoid areas of high vessel traffic, such as Parker Point (Morgan et al. 2017).		
Narrow Sawfish *Anoxypristis cuspidata*	MI	SH - L	-	In Australia, the Narrow Sawfish is found across northern Australia from the Pilbara Coast Western Australia) to Broad Sound (Queensland). It is a bentho-pelagic species that inhabits coastal and estuarine habitats. It occurs to depths of at least 40 m (Last and Stevens 2009). Adults mainly occur offshore while juveniles and pupping females require inshore and estuarine habitats.	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured for pupping females	**Possible** – species has not previously been recorded from the area, but shallow nearshore waters are favoured for pupping females
Reef Manta Ray *Manta alfredi*	MI	SH - L	-	The Reef Manta Ray is commonly sighted on the continental shelf, around tropical and subtropical coral and rocky reefs, islands and along coastlines, preferentially occupying shallow depths < 20 m (Armstrong et al. 2020). Reef Manta Rays are capable of long-distance dispersal when habitat is continuous but also display a high degree of site fidelity.	**Possible** – may be found in areas of suitable habitat adjacent to the Project development footprint	**Likely** – expected to occur in shallow nearshore waters around islands within the Dampier Archipelago.
Giant Manta Ray *Manta birostris*	MI	SH - L	-	The Giant Manta Ray has a circumglobal distribution and is considered an oceanic species found predominantly in cooler, temperate to subtropical waters (Last and Stevens 2009).	**Unlikely** – Pelagic species, Project area not preferred habitat.	**Possible** – may be found in deeper waters

Species	EPBC Act 1999		BC Act 2016 Status	Preferred Habitat/Description	Likelihood of Occurring within the Project Area	
	Status	Presence Rank			1 km	20 km
Fish						
Southern Bluefin Tuna *Thunnus maccoyii*	CD	SH - L	-	The Southern Bluefin Tuna is found in the south-west and south-east Atlantic Ocean, eastern and western Indian Ocean and the south-west Pacific Ocean. Adult Southern Bluefin Tuna in Australian waters, ranges widely from northern WA to the southern region of the continent, including Tasmania, and to northern New South Wales, appearing in eastern Australian waters mainly during winter. Juveniles of one to two years of age inhabit inshore waters in WA and South Australia. The Southern Bluefin Tuna is highly migratory, occurring globally in waters between 30–50° S, though the species is mainly found in the eastern Indian Ocean and in the south-west Pacific Ocean. There is a single known spawning ground between Java and northern WA.	**Unlikely** – Not expected to occur, not identified in PMST report. Pelagic species, Project area not preferred habitat.	**Possible** – migrating juveniles may be found in waters of the outer Dampier Archipelago.

APPENDIX D – RISK ASSESSMENT OF POTENTIAL IMPACTS

Inherent risk ratings assume minimum industry standard would be achieved without the application of any additional management controls.

Management controls relevant to each inherent risk were identified, applying the management response criteria (Table D - 1) and particularly focussing on those inherent risks rated as 'moderate' and above.

Risk ratings were assigned to each impacting process using the risk matrix in Table D - 2

Table D - 3 presents the outcomes of the risk assessment, including the inherent and residual risks and management controls.

Table D - 1. Risk rating and associated risk management response

Rating	Risk management response
Critical	Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention.
High	Risks that exceed the risk acceptance threshold and require proactive management. Includes risks for which proactive actions have been taken, but further risk reduction is impracticable. However active monitoring is required, and the latter requires the signoff by Business Unit senior management.
Moderate	Risks that lie on the risk acceptance threshold and require active monitoring. The implementation of additional measures could be used to reduce the risk further.
Low	Risks that are below the risk acceptance threshold and do not require active management. Certain risks could require additional monitoring.

Table D - 2. Risk assessment matrix

		Consequence	**1-Minor** Localised disturbance to environmental, cultural or social values that is confined to the operating footprint and can be rectified or reversed within a day	**2-Medium** Localised harm to environmental, cultural or social values that is confined to the operating footprint and can be rectified or reversed within weeks of work effort or natural recovery	**3-Serious** Harm to regionally significant environmental, cultural or social values that can be rectified or reversed within weeks to months of work effort or natural recovery	**4-Major** Harm to nationally significant environmental, cultural or social values that can be rectified or reversed within months to years of work effort or natural recovery	**5-Catastrophic** Widespread harm to globally significant environmental, cultural or social values that can be rectified or reversed within years to decades of work effort or natural recovery
Likelihood	**A-Almost certain** Recurring event during the lifetime of an operation / project. Occurs more than twice per year		Moderate	High	Critical	Critical	Critical
	B-Likely Event that may occur frequently during the lifetime of an operation / project. Typically occurs once or twice per year		Moderate	High	High	Critical	Critical
	C-Possible Event that may occur during the lifetime of an operation / project. Typically occurs in 1-10 years		Low	Moderate	High	Critical	Critical
	D-Unlikely Event that is unlikely to occur during the lifetime of an operation / project. Typically occurs in 10-100 years		Low	Low	Moderate	High	Critical
	E-Rare Event that is very unlikely to occur during the lifetime of an operation / project. Greater than 100-year event		Low	Low	Moderate	High	High

Table D - 3. Risk assessment of maintenance dredging/disposal and management controls

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
Works are carried out without required approvals or are not consistent with the approved activities.	**Social Impact** Non-compliance with legal requirements resulting in licence to operate and/or reputational impact.	• Relevant approvals are not sought. • Scope of work is not consistent with approved activities. • Approval has expired.	3	C	High	• Ensure all relevant approvals (environmental and operational) are valid and do not expire within current works period. • Ensure all conditions of approval are communicated to the Contractor prior to works commencing. • Ensure all boundary areas for dredging and spoil disposal are well documented and provided to the dredge contractor prior to commencing works. • Check the dredge contractor has measures in place to meet conditions of approval and ensure boundary areas are not exceeded. • Ensure all reporting requirements are met.	3	D	Mod
Excessive visual exhaust emissions from vessels associated with the dredging program.	**Social Impact** Community concerns and/or reputational damage.	Operation of internal combustion engines on vessels.	1	C	Low	Adherence to MARPOL Annex VI for international vessels. Where required, Vessel to hold an International Air Pollution	1	C	Low

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
						Prevention (IAPP) Certificate as appropriate to class.			
Noise and light emissions from vessels associated with the dredging program.	**Environmental Impact** Behavioural changes to marine megafauna (transiting, resting, mating, nesting and foraging).	• Transportation, Equipment & Supplies (vessel related noise). • Light emissions from vessel operations during hours of darkness.	2	C	Mod	Maintenance dredging campaigns will be relatively short in duration (typically less than 4 weeks); the short duration limits potential impacts to fauna. Detailed management actions for vessel noise and light emissions are provided in Section 6.1.	2	D	Low
Vessel collision, grounding or collision with marine infrastructure.	**Social Impact** Community concerns and/or reputational damage.	Failure to navigate safely or to avoid a collision.	2	C	Mod	Management actions for vessel collision and grounding are detailed in Section 6.5	2	D	Low
	Environmental Impact Reduction in water quality.		2	C	Mod		2	D	Low
Interaction of marine megafauna with vessels associated with dredging activities.	**Environmental Impact** Injury to or fatality of marine megafauna (including protected species).	• Entrainment of marine megafauna at the drag head. • Vessel collision with marine megafauna.	2	C	Mod	Maintenance dredging campaigns are of relatively short duration (typically less than 4 weeks); the short duration limits potential impacts to fauna. Detailed management actions for vessel interaction with marine	2	C	Mod
	Social Impact		3	C	High		3	C	High

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
	Injury/fatality of marine megafauna leading to potential non-compliance with regulatory requirements and/or reputational issues					megafauna are provided in Section 6.1.			
Elevated turbidity and production of visible plumes from dredging and spoil disposal activities.	**Environmental Impact** Decrease in water quality.	• Dredging activities have the potential to increase suspended sediments and turbidity levels leading to a reduction in water quality. • Visible turbidity plumes may lead to community concerns/complaints.	1	B	Mod	Risks associated with elevated turbidity will be controlled in accordance with the management actions detailed in Section 6.2. Water quality will be monitored to determine whether water quality has been reduced (see Section 8).	1	D	Low
	Social Impact Visible turbidity plumes present near local values (areas for recreational activities) result in community complaints and/or loss of trust that takes weeks/months to resolve with residual local reputational impact.		2	C	Mod		2	C	Mod
Elevated turbidity and increased sedimentation rates	**Environmental Impact** Sub-lethal effects on benthic primary producers (habitat disturbance) outside the	Elevated turbidity and increased sedimentation resulting in temporary	2	B	High	Risks associated with elevated turbidity and increased sedimentation rate will be controlled	2	D	Low

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
from dredging and disposal activities.	approved dredging and disposal footprint.	reduction in productivity and growth rates due to:				in accordance with the management actions provided in Section 6.2.			
	Social Impact Sub-lethal effects on benthic primary producers leading in turn to potential non-compliance with regulatory conditions and/or reputational impacts.	• reduced light penetration. • smothering of benthic habitats. • damage to filter feeding organisms.	2	C	Mod	Water quality will be monitored to provide an early warning of any potential impacts to benthic primary producer habitat within the Zone of Influence from the dredging and disposal activities (see Section 8).	2	D	Low
	Environmental Impact Mortality of coral (habitat loss).		3	C	High		3	E	Mod
	Social Impact Mortality of coral leading in turn to potential non-compliance with regulatory conditions and/or reputational impacts.		3	C	High		3	E	Mod
Dredging and disposal activities occurring during a mass coral spawning event.	**Environmental Impact** Reduction in the success of coral fertilisation during a significant spawning event. Changes to settlement and	Elevated turbidity levels as a result of dredging and spoil disposal activities present a risk to coral fertilisation if elevated turbidity levels occur near coral	2	C	Mod	• Mass coral spawning in the Pilbara occurs between February and April, with most spawning occurring in March.	2	D	Low

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
	early development of coral larvae after spawning events, when most larval metamorphosis and recruitment occurs.	reefs (WAMSI has shown the risk is to fertilisation, rather than to the larvae. As fertilisation occurs within hours of spawning, before significant transport occurs, the risk from elevated turbidity is limited to areas immediately adjacent to coral reefs).				• Prediction of the timing of mass coral spawning has been completed to determine the expected timing of mass coral spawning within the February to April period each year for the duration of the sea dumping permit. • The period between February and April is within cyclone season in the Pilbara; dredging is unlikely to occur during these months. • Dredging activities would need to occur within 500m of coral spawning for suspended sediment levels to be likely to cause impacts. Dredging activities are not proposed to occur within 500m of coral communities. • If dredging is to occur across the period of mass coral spawning, alter the dredging activities to ensure turbidity plumes do not approach coral reefs e.g. change			

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
						to a different location within the dredge area.			
Introduction of Invasive Marine Species (IMS).	**Environmental Impact** The introduction and establishment of IMS via the vessels or equipment associated with dredging activities leading to ecological impacts to other marine species or habitats.	The use of intrastate, interstate and/or overseas vessels has the potential to introduce IMS to the Port of Dampier from contaminated hulls and/or ballast waters which could impact benthic communities.	3	C	High	Detailed management actions for IMS are detailed in Section 6.4.	3	D	Mod
	Social Impact The introduction and establishment of IMS leading to non-compliance with regulatory requirements and/or reputational impacts.		3	C	High		3	D	Mod
Unplanned dredging and/or spoil disposal in areas other than approved operational areas.	**Environmental Impact** Direct localised disturbance to benthic communities and habitats.	Dredging activities outside of approved operational areas due to: • Incorrect communication of approved operational areas.	3	C	High	Detailed management actions for dredging and dredge spoil management are provided in Section 6.2 and 7.3, respectively.	3	D	Mod
	Social Impact		3	C	High		3	D	Mod

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
	Impact to marine Aboriginal heritage sites leading to impacts to cultural heritage values and/or reputational impacts. Non-compliance with SDP, leading to impact to licence to operate and/or reputational impacts.	• Incorrect positioning of vessel. • Inaccurate vessel positioning system.							
Hydrocarbon spill event or unplanned discharge from a vessel associated with dredging activities.	**Environmental Impact** Reduction in water quality, toxic effects on marine fauna and flora, sediment contamination and smothering of benthic primary producers.	Hydrocarbon spill due to: • Vessel collision. • Diesel or heavy fuel oil spill during refuelling (bunkering). • Hydraulic oil spills due to equipment failure (for example, burst hydraulic hose). • Incorrect storage and handling of hydrocarbons. • Release of oily bilge waters. • Contaminated deck wash.	4	C	Crit	Detailed management actions for hydrocarbons and other spills are provided in Section 6.3.	3	E	Mod
	Social Impact Potential non-compliance with regulatory requirements and/or reputational issues.		3	C	High		3	E	Mod
	Environmental Impact		2	C	Mod		2	D	Low

Scenario/Activity	Potential Impact	Cause	Consequence	Likelihood	Inherent Risk	Management Control	Consequence	Likelihood	Residual Risk
Sewage or other waste (greywater, food waste, deck drainage and bilge) discharge event or unplanned discharge into the marine environment.	Reduction in water quality through eutrophication, increased particulate concentration and introduction of toxicants.	Unplanned discharge of sewage or other waste during operations resulting from: • incorrect handling or storage of waste. • equipment malfunction/failure.				Detailed management actions for sewage and other waste discharge and spills are provided in Section 6.3. Routine discharges from dredging vessels (sewage and greywater, food waste, deck drainage and bilge) will comply with MARPOL requirements. Sewage and putrescible wastes will be discharged beyond 3 nm.			
	Environmental Impact Reduction in water quality leading to a decline in the health of benthic communities and habitats and marine fauna.		1	C	Low		1	D	Low
	Social Impact Reduction in water quality affecting social amenity.		2	C	Mod		2	D	Low

APPENDIX E - SPOIL DISPOSAL OPTIONS ASSESSMENT

A comparative assessment of the risks of various options to project cost, human health and the environment is presented in this appendix. The assessment adopts a semi-quantitative ranking of risks (consequence x probability) as detailed in Table E - 1. As a guide, a ranking of 3 would generally rule out an option.

Table E - 1. Dredge spoil risk ranking matrix consequences

	1 - Minimal	**2 - Moderate**	**3 - Extreme**
Cost	Less than 5% of the total campaign cost	5 to 50% of the total campaign cost	Greater than 50% of the total campaign cost
Human Health	Low-level short-term inconvenience or symptoms.	Injury / illness with moderate damage or impairment (<30% on impairment scale) to one or more persons.	Multiple fatalities or severe permanent impairment to multiple people
Environment	Localised harm to the environment that is confined to the operating footprint, affects no sensitive receptors and can be rectified or reversed in less than a week	Harm to a regionally significant sensitive receptor that can be rectified or reversed within weeks to months of work effort or natural recovery	Widespread harm to a globally significant sensitive receptor that can be rectified or reversed within years to decades of work effort or natural recovery

Based on the assessment (Table E - 2), the option of ocean disposal to spoil grounds that have been in operation for many years and have received similar material in greater volumes in the past is the preferred option.

Table E - 2. Spoil disposal options assessment

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
1	Do nothing (not dredging)	The "do nothing" option is included here for reference. The dredging works are required in order for safe and effective export of iron ore from the Proponent's Dampier facilities to continue. Not carrying out dredging would jeopardise the safety and effectiveness of these operations	Rating **3**. Considerations include: The cost of not dredging will ultimately have an extreme impact on the Proponent's Dampier operations, with shallowing of the channels progressively limiting the loaded departure drafts of bulk carriers. Without dredging, these operations may become non-viable over time. Estimated cost premium: extreme	Rating **1**: Considerations include: Nil impact	Rating **1**: Considerations include: Nil impact
2	Dredging with ocean disposal	This option involves a trailing suction hopper dredge (TSHD) transporting dredged material to an approved offshore disposal site.	Rating **1** Considerations include: The cheapest / baseline option Estimated cost premium: nil	Rating **1**: Considerations include: None likely: Material is not toxic and dredging is not in recreational use area	Rating **1**: Considerations include: Turbidity impacts will occur around the sites of dredging and disposal but will not be at a level causing mortality of benthos in areas of high conservation value
3	Disposal to land	This option involves creating a bunded disposal site on land, which would be filled with dredged material by the TSHD via a pipeline. A suitably sized onshore disposal site would need to be located close (<~500m) to deep water, to	Rating **2**: Considerations include: • Large additional cost of secondary handling of material from dredge hopper to land (discharge time of ~1hr compared to 30mins for ocean disposal): ~$7M	Rating **1**: Considerations include: • Material is not toxic; • Windblown dust would require management • Low lying coastal areas are often natural drainage areas, stormwater would need to	Rating **3**: Considerations include: • Holding ponds would be extensive in size (estimated ~28ha) to allow drying; Coastal land not used for industry

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
		allow access by the TSHD. Beneficial reuse could be achieved by building up the elevation of low-lying land thus making it more valuable or useable. Overall, ~28ha of land would be required for this disposal site (assuming an average fill height of 5 m), however this area could be built up progressively over time. The Proponent has assessed this option, however no suitable locations have been identified. The Proponent does not have current requirements for additional land areas. The material to be disposed consists predominantly of fine sand, silts and clays and is thus relatively unsuitable for use as construction fill. Additional ground improvement is likely to be required before the area could be used commercially.	• Costs of constructing bund and decant filters: ~$7.5M • Potential dredging delays while waiting for disposal area to drain: ~$7M • Ongoing costs managing this site (e.g. dust management, stormwater drainage etc): ~$2M • Additional ground improvement before use: ~$15M Estimate cost premium: $38.5M	be managed to avoid stagnant water pools etc.	around the Dampier Harbour is of high conservation value. Clearing of native vegetation is likely to be required. • Disposal at the onshore site may impact on the underlying groundwater via infiltration of salt water from the disposed material • Decant water with high sediment load would return to the sensitive nearshore environment
4	Reclamation of seabed	This option involves creating a rock armoured disposal site on an area of relatively shallow	Rating **3**: Considerations include:	Rating **1**: Considerations include: • Material is not toxic;	Rating **3**: Considerations include:

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
		seabed, which would be filled with dredged material by the TSHD via a pipeline. A suitably sized reclamation area would need to be located close (<~500m) to deep water, to allow access by the TSHD. Beneficial reuse could be achieved by creating new land. Overall, ~20ha of seabed would be required for this disposal site (assuming an average fill height of 10 m), however this area could be built up progressively over time. The Proponent has assessed this option, however no suitable locations have been identified. The Proponent does not have current requirements for additional land areas. The material to be disposed consists predominantly of fine sand, silts and clays and is thus relatively unsuitable for use as construction fill. Additional ground improvement is likely to	• Large additional cost of secondary handling of material from dredge hopper to land (discharge time of ~1hr vs 30mins for ocean disposal): ~$7M • Costs of constructing ~1.5km of rock armoured seawall and decant filters: ~$70M • Potential dredging delays while waiting for disposal area to drain: ~$7M • Ongoing costs managing this site (e.g. dust management, stormwater drainage etc): ~$2M • Additional ground improvement before use: ~$15M Estimate cost premium: $101M	• Windblown dust would require management	• Reclamation area would be extensive in size (estimated ~20ha); nearshore benthic habitat is of high conservation value. • Disposal at the onshore site may impact on the underlying groundwater via infiltration of salt water from the disposed material • Decant water with high sediment load would return to the sensitive nearshore environment • Turbidity would be generated during the rock wall construction • Potential impact/modification of hydrodynamic/current patterns adjacent to reclaimed area unknown.

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
		be required before the area could be used commercially.			
5	Beach renourishment	This option involves using dredge material to renourish coastal areas that have experience coastal erosion. Dredged material would be pumped to beach by the TSHD via a pipeline. Large beach area(s) would need to be located close (<~500m) to deep water, to allow access by the TSHD. Beneficial reuse could be achieved by renourishing these eroded areas. Suitable beach areas of ~3.5ha per year would be required. The Proponent has assessed this option, however no suitable locations have been identified. The Proponent has not identified any nearby eroded areas that meet the access and dimension requirements. The material to be disposed consists predominantly of fine sand, silts and clays, and the water concentration in each	Rating **1**: Cost considerations include: • Large additional cost of secondary handling of material from dredge hopper to land (discharge time of ~1hr compared to 30mins for ocean disposal): ~$7M Estimate cost premium: $7M	Rating **1**: Considerations include: • Material is not toxic; • Windblown dust may require management • Require large area on the beach to contain all of the dredged material, which could affect beach access and aesthetics during disposal	Rating **3**: Considerations include: • Renourishment area would be extensive in size (estimated ~3.5ha per year); likely that some smothering of nearshore benthic habitat would occur. • Return water with high sediment load would return to the sensitive nearshore environment • Significant potential for process to be erosive instead of renourishing the area, due to fine dredged material and large water concentrations. • Potential for impacts on shore species, including birds

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
		hopper load is likely to be relatively high (80 – 90%), plus additional water will be required to mobilise and discharge each hopper load. This material is relatively unsuitable for use as beach renourishment, and the large water concentration pose a significant risk of eroding the beach further rather than renourishing it.			
6	Offsite disposal/ reuse	This option involves temporary stockpiling of material on land within a bunded disposal site, which would be filled with dredged material by the TSHD via a pipeline, and progressively excavated and trucked away for disposal or reuse at an external site. A suitably sized temporary onshore stockpile site would need to be located close (<~500m) to deep water, to allow access by the TSHD. Beneficial reuse could be achieved by reusing the dredged material in some way. A stockpile site of ~3ha would be required, assuming an average fill height of 5m (with	Rating **2**: Cost considerations include:: • Large additional cost of secondary handling of material from dredge hopper to land (discharge time of ~1hr vs 30mins for ocean disposal): ~$7M • Costs of constructing bund and decant filters: ~$8M • Dredging delays while waiting for this small disposal area to drain are very likely: ~$7M • Excavation and trucking costs to remove material (assumed final destination 20km from temporary stockpile, truck cycle time of ~2hr): ~$16.5M • Additional treatment to beneficiate material to make it suitable for	Rating **2**: Considerations include: • Material is not toxic; • Significant trucking operation on public roads would be required, over 500 truck movements per day. Related public safety and noise implications are significant.	Rating **3**: Considerations include: • Temporary stockpile area would be significant in size (estimated ~2ha); Coastal land not used for industry around the Dampier Harbour is of high conservation value. Clearing of native vegetation may be required. • Disposal at the onshore site may impact on the underlying groundwater via infiltration of salt water from the disposed material

Option	Description	Commentary	Cost Risk	Human Health Risk	Environmental Risk
		capacity for ~1 week of dredging). This temporary site would need to be constructed before and removed after each dredging session. The Proponent has assessed this option, however no suitable reuse options/locations have been identified. As the material to be disposed consists predominantly of fine sand, silts and clays it is not a particularly useful product for reuse purposes. It is likely that in this scenario, the material would be taken to a landfill site, and thus does not equate to beneficial reuse of the dredged material.	reuse and/or dust management if used for landfill $2.5M Estimate cost premium: $41M		• Decant water with high sediment load would return to the sensitive nearshore environment. Compared to the onshore disposal and reclamation options, the relative turbidity will be significantly higher due to the smaller disposal site volume.