Draft Construction Environmental Management Plan

New Marine Facilities to Service Mandorah and Cox Peninsula

ZMD01890

Prepared for
Department of Infrastructure, Planning and Logistics

15 February 2023

Cardno

now

Stantec

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Version	Effective Date	Description of Revision	Prepared by	Reviewed by
Rev A	15/12/2021	Draft for DIPL Review	LR	DRS / DIPL
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Appendices

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1 Environment Policy

The construction contractor(s) is to incorporate and attach their Company Environment Policy within the final Construction Environmental Management Plan (CEMP).

2 Background

2.1 Project Description

The Northern Territory Government (NTG) has identified the need to develop a safer, *Disability Discrimination Act 1992* (Cwth; DDA) compliant and more weather-resistant ferry berthing facility at Mandorah, to improve transport connectivity between Cox Peninsula and Darwin. Cardno (NT) Pty Ltd (Cardno) were engaged to undertake the design and documentation services for the project, as well as to assist with environmental investigations and approvals. The proposed facility uses two large breakwaters to form a safe harbour around new ferry berthing and passenger boarding infrastructure. The project is located adjacent the existing Mandorah Jetty, which currently services the transfer of ferry passengers, but does not comply with access requirements for persons with a disability. Key components of the proposed facilities, shown in **Figure 2-1**, are:

- A safe harbour formed by rock armoured breakwaters – large northern breakwater and smaller southern breakwater;
- Capital dredging of an access channel, turning basin and berthing areas for the ferry, as well as safe navigation of recreational vessels to and from the boat ramp;
- A new single lane boat ramp within the harbour, connecting to the existing carpark at the site;
- A new floating pontoon, gangway, jetty (TBC) and rock armoured causeway inside the harbour to allow passengers to access the ferry from land;
- A ferry terminal building established by repurposing an existing building at the site (Lot 50) and new carpark with a short road connecting it to the existing carpark, as well as pedestrian paths and minor onshore amenities; and
- Minor modification to the existing carpark to incorporate access and manoeuvring for the new boat ramp, as well as allow additional trailer parking.

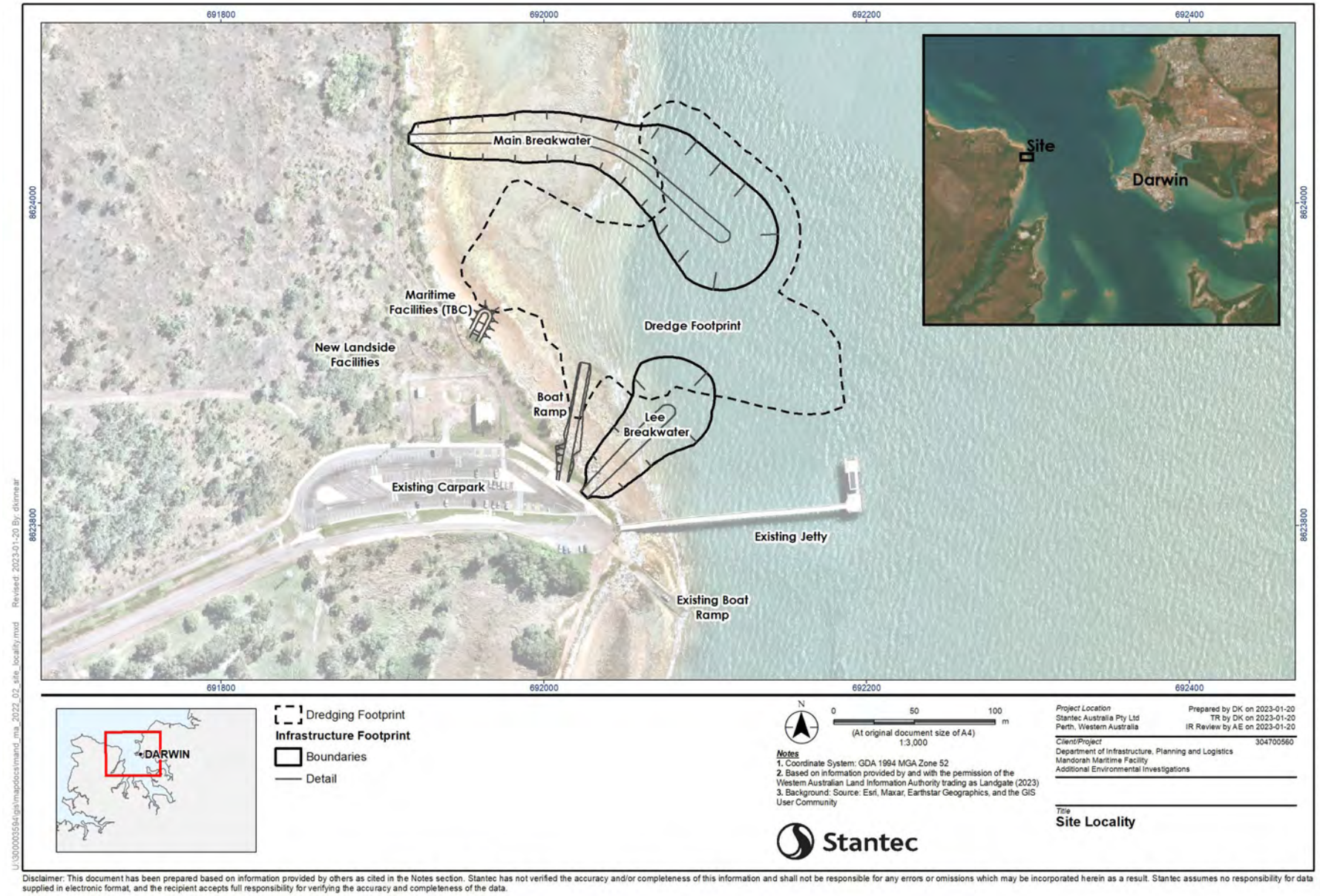


Figure 2-1 Project infrastructure layout (extract from design drawing R21-4488)

2.2 Location and Tenure

The project site is located at 10 – 15 Charles Point Rd, Mandorah NT 0822. Mandorah is located near the eastern tip of the Cox Peninsula in the Northern Territory, approximately six kilometres to the west of Darwin (**Figure 2-2**). Access to Mandorah from Darwin is via the regular ferry service, or by driving approximately 120 km along the road network.

The site lies within the Hundred of Bray land parcel, Cox Peninsula. The landside project footprint is within the existing Charles Point Road Reserve, Lot 116 and Lot 50, which are under the ownership of the NT Government. Current zoning is as follows (see **Figure 2-3**):

- Charles Point Road and Existing Carpark – Main Road (M);
- Lot 116 – A portion of Lot 116 has recently been rezoned from Rural (R) to M: from its western, southern and eastern boundaries to a northern boundary that runs east-west, approximately 100 metres north of the northern breakwater's abutment to land. The remainder of Lot 116 is zoned R;
- Lot 50 – Recently rezoned from Rural Living (RL) to M; and
- Lot 44 – Rural Living (RL): Private property adjacent to project area.

2.2.1 Native Title

Lot 50 has been investigated by the NT Government to understand the status of Native Title. The investigations divided the lot into three areas (see **Figure 2-3**):

Area A

According to the plans, the Radio Australia 'Jetty Garage and Store Terminal Building' was built at Cox Peninsula in approximately 1966. Available evidence indicates that native title has been extinguished in relation to the area required for this facility, which would include the internal road and hardstand area depicted in aerial photography from 1994.

Area B

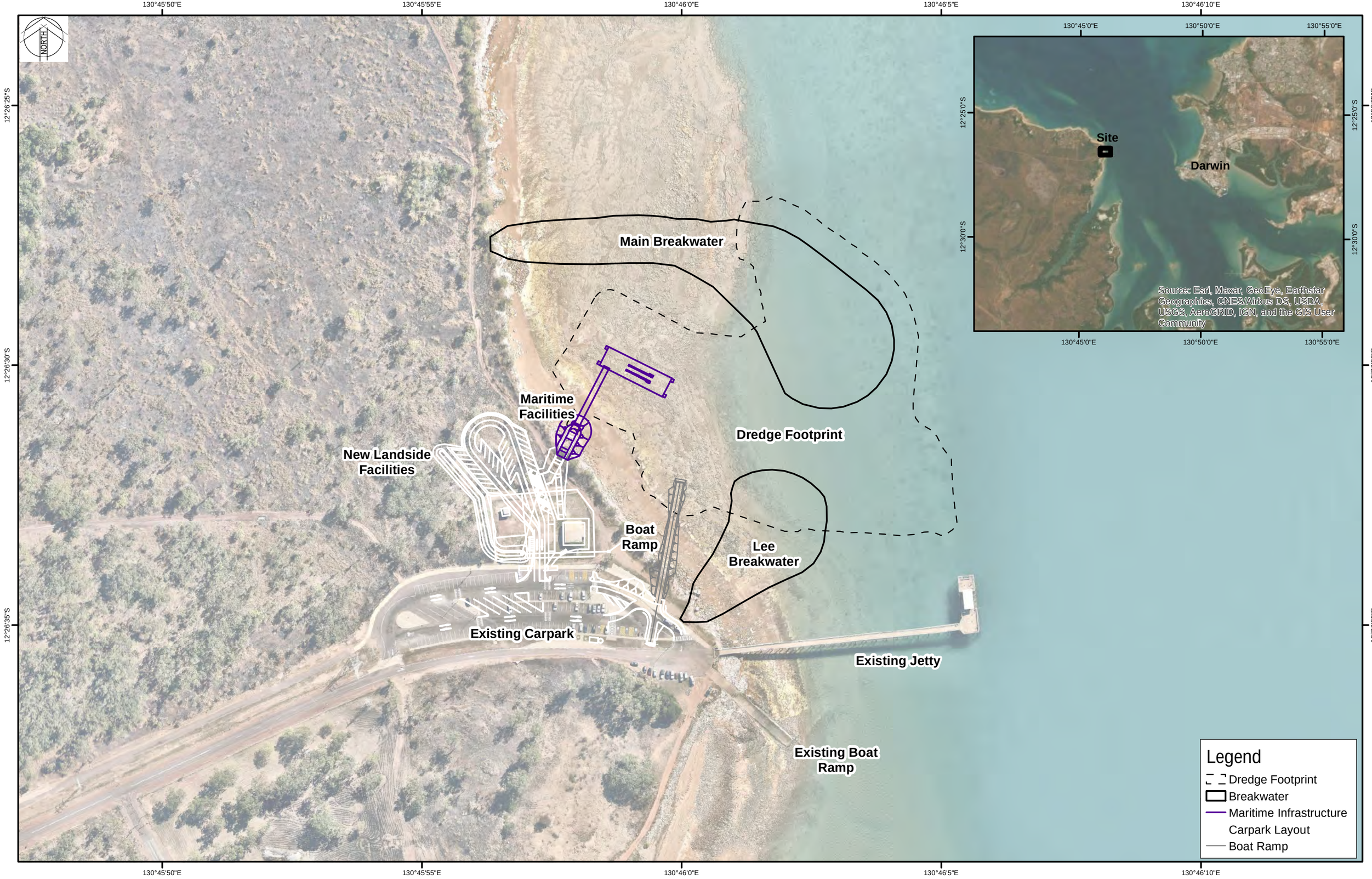
Telstra has confirmed that an Optical Fibre Cable Repeater facility is sited on Section 50 Hundred of Bray. The available information suggests that the building in Area B was constructed by Telstra and not Telecom and therefore cannot be classified as public work. Therefore, the evidence does not suggest that Native Title over this section of the site has been extinguished. The proposed development has been designed to limit the disturbance of this portion of the lot.

Area C

Plans and aerial imagery depict a demountable structure in Area C. This facility has now been removed. There is no evidence of construction by government, and therefore it cannot be classified as public work. In addition, the fact that the infrastructure has now been removed suggests it was not a fixture. The available evidence does not suggest that native title has been extinguished in Area C. The proposed development has been designed to limit the disturbance to this portion of the lot.

2.2.2 Significant Sites

Several significant Aboriginal heritage sites have been identified in the vicinity of the project, and restricted work areas have been established to prevent disturbance of these areas (**Figure 2-3**). These are captured by the Aboriginal Areas Protection Authority (AAPA) certificate (C2019/067).



Cardno

Perth, Western Australia

Date
19/11/2021

Size
A3

Scale
0 100 Meters

SITE LOCALITY

MANDORAH MARINE FACILITIES

DRAFT CEMP

FIGURE 2-2

FILE: K:\Projects\DZ1910_Mandorah Marine Facilities\Design Tech\Sketches\ArcGIS\Build\Figure 4-2_Existing and Proposed Land ZoningREV.mxd

Cardno

Darwin, Northern Territory

Date
21/12/2021

Size
A3

Scale
1:3,000

0 0.05 0.1km

EXISTING LAND ZONING

MANDORAH MARINE FACILITIES

DRAFT CEMP

FIGURE 2-3

2.3 Construction Process

2.3.1 Overview

The project comprises of relatively distinct infrastructure items that are expected to be developed in a staged approach, with some stages overlapping or constructed in tandem. The exact construction program will be defined by the contractor. It is anticipated that the project will proceed as follows:

- Cutter suction dredging;
- Backhoe dredging;
- Breakwater construction;
- Installation of boat ramp and causeway;
- Installation of maritime infrastructure;
- Installation of landside infrastructure including carpark, roads and paths; and
- Refurbishment of existing building as ferry terminal.

2.3.2 Dredging and Disposal

The dredging works shall see a total volume of approximately 85,000 - 100,000 m^3 dredged. Management associated with dredging and disposal actions is covered in the project's *Draft Dredging and Spoil Disposal Management Plan* (DSDMP) (Stantec, 2023). Handling of material once brought onshore is covered in this Draft CEMP. The dredging is planned to occur in two stages, which may occur concurrently if practicable, as follows:

Stage 1

Approximately 15,000 - 30,000 m^3 of unconsolidated marine sediments will be dredged by Cutter Suction Dredge (CSD) and piped offshore approximately 1 km for dispersal in the water column.

Stage 2

Approximately 70,000 m^3 of rock material will be dredged by backhoe dredger and deposited on land for reuse in the breakwater cores. The construction of the breakwaters will occur concurrently with the dredging to reduce the impacts of onshore stockpiling of material. Any dredge spoil that is not used within the breakwater cores will be utilised within the causeway construction or as general fill. There may be the need to transport unused fill offsite for use in other projects.

2.3.3 Breakwater Construction

The breakwaters are expected to be constructed outwards from land, using land-based equipment (see **Figure 2-4** and **Figure 2-5**). The core will be placed and then armoured immediately, so that it is retained. Portions of the core may also be placed directly as the material is dredged. A layered construction approach may be employed due to the breakwater height; whereby a portion of the profile is built out to the end of the breakwater, then the crest is installed working back towards the land.

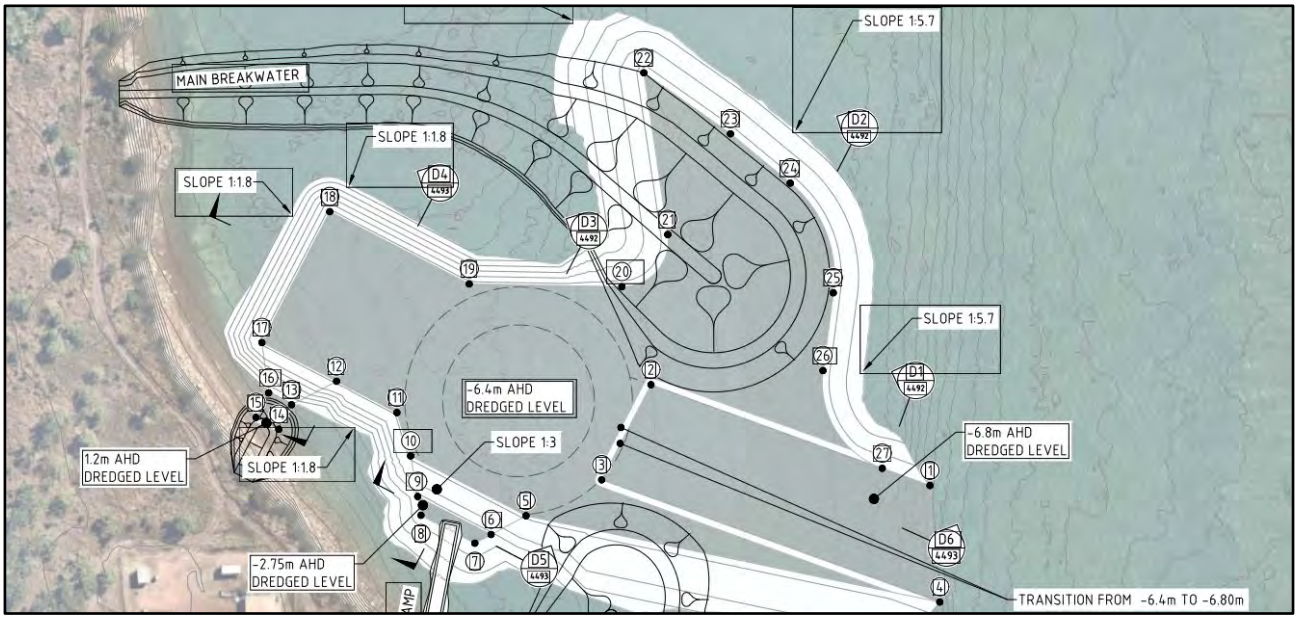


Figure 2-4 Dredge layout (extract from design drawing R21-4491)

Figure 2-5 Example of staged breakwater construction (Ocean Reef Marina – DevelopmentWA, 2021)

The construction of the breakwaters is expected to involve the following plant:

- Dump trucks for transport and dumping of the core material;
- Excavators for levelling and shaping of the crest of the core after it is dumped by the trucks;
- Trucks and wheel loaders for transport and handling of the filter layer and blinding layer;
- Flatbed trucks/road trains for transport of the armour rock from the quarry to the site;

- (Long reach) excavators for:
- Shaping of the (sides of the) core;
- Placement of the filter layer over the core;
- Placement of the armour rock; and
- Placement of the toe construction rock.

The main breakwater is expected to take 3-4 months to construct and the lee breakwater 1-2 months, depending on construction methodology and weather. The main breakwater should be constructed first, followed by the lee breakwater.

2.3.4 Boat Ramp and Causeway Construction

The causeway and boat ramp involve similar construction techniques to the breakwaters, though on a smaller scale. They cannot be constructed until the breakwaters are complete, as they have been designed assuming harbour protection. The construction will involve installation of a retained core (by rock armour) then placement of pre-cast concrete panels or cast in-situ concrete for their respective surfaces. The core is to be retained by geotextile and the rock armour is to be grouted. This infrastructure is expected to take approximately 1-2 months to install.

2.3.5 Maritime Facilities Construction

Maritime facility infrastructure is to include a floating pontoon, gangway, piles and potentially a jetty (piled). The maritime infrastructure cannot be constructed until the breakwaters are complete, as they have been designed assuming harbour protection. The facilities will ultimately connect to the causeway described above. It is expected that piles will be installed first (driven or screwed) then infrastructure installed as necessary, e.g.:

- Pontoon installed amongst guide piles;
- Jetty placed on piles (if applicable); and
- Gangway connected between causeway and pontoon.

Piles are likely to be installed from a pilling barge, but some may be installed from landside, depending on contractor preference. The pontoon will be floated and towed into position and the gangway likely installed by crane.

2.3.6 Carpark, Roads and Paths

Carparks, roads and paths are expected to be installed once the large construction plant have left site, to avoid degradation of such infrastructure if built earlier (e.g. over transport routes). Earthworks associated with pavement is expected to be minimal, with some cutting required for the boat ramp connection and maritime facilities access ramps, as well as drainage. This may employ an excavator and be carried out alongside internal maritime infrastructure installation – e.g. boat ramp and causeway connection.

Clearing and levelling for the carpark will be minimised but necessary to dictate drainage. A portion of the carpark footprint is already cleared.

2.3.7 Building Refurbishment

The existing building (former Radio Australia) is to be refurbished for use as a ferry terminal. This will involve the removal of cladding and structurally inadequate components and replacement to ensure structural conformance. Installation or reinstatement of facilities such as ablutions is also required. It is expected that the refurbishment will be one of the last project construction activities.

2.3.8 Temporary Site Works

All construction access and works, site facilities, clearing and stockpiling is to occur within the portion of Lot 116 proposed to be rezoned M – Main Road (see **Figure 2-3**). Any additional land required by the contractor shall include permission from the land owner and any other relevant permits. The site use and layout is to be determined by the contractor, with approval from DIPL and in accordance with the conditions of Development

Consent. Construction facilities must be established and maintained to cause minimal impact on the environment through the measures outlined in this Draft CEMP.

3 Draft CEMP Objectives

The objective of this Draft CEMP is to guide implementation of specific environmental risk mitigation and minimisation procedures for the project's construction activities. The Draft CEMP has been prepared in alignment with, and incorporating content from, DIPL's *Contractor's environmental management plan template* (2020).

Risk mitigation is to be implemented to manage the risk to key environmental factors, identified in the *Environmental Referral Report* (Cardno, 2022b). The Draft CEMP does not consider impacts to the environment associated with the dredging and disposal activities. These are managed by the project's Draft DSDMP (Stantec, 2023). The Contractor's Final CEMP should ensure the requirements of this draft document are incorporated and adhered to as part of specific construction planning. This Draft CEMP has been structured as follows:

- **Chapter 1** stipulates incorporation of the contractor's Environment Policy;
- **Chapter 2** details the project background and description;
- This chapter (**3**) describes the objectives of the Draft CEMP;
- **Chapter 4** details the project's organisational structure and responsibilities;
- **Chapter 5** details relevant legislation, regulations and standards to be adhered to;
- **Chapter 6** describes relevant approvals, licences and permits required for the project;
- **Chapter 7** outlines community consultation and complaints handling procedures;
- **Chapter 8** discusses non-conformance identification and reporting;
- **Chapter 9** outlines the corrective action process;
- **Chapter 10** describes monitoring of the implementation of the CEMP;
- **Chapter 11** describes auditing of the implementation of the CEMP;
- **Chapter 12** prescribes environmental training and inductions;
- **Chapter 13** discusses emergency management during project construction; and
- **Chapter 14** describes the environmental risk assessment of construction activities and specific management.

The following documents are referenced in, or should be given due consideration when reading, this Draft CEMP:

- *Environmental Referral Report* (Cardno, 2022b): This document presents the necessary details to refer the project to the Northern Territory Environmental Protection Authority (NT EPA). This Draft CEMP is an appendix to the referral report, detailing specific management to minimise environmental risk associated with construction actions;
- *Terrestrial Environment Report* (Cardno, 2022c): Details the terrestrial environment and ecology relevant to the project site, critical to understand risk of the project to these environmental aspects;
- *Marine Environment Report* (Cardno, 2022d): Details the marine environment and ecology relevant to the project site, critical to understand risk of the project to these environmental aspects;
- *Draft Dredging and Spoil Disposal Management Plan (DSDMP)* (Stantec, 2023b): Defines the proposed dredging actions and necessary controls to avoid or minimise risk for, and impact to, the marine environment; and
- *Design Report* (Cardno, 2022e): Details the design requirements, basis, inputs, calculations and outcomes for the new proposed infrastructure - providing additional detail on what is to be constructed.

- *Supplementary Environmental Report (SER)* (Stantec, 2023a): This document presents supplementary information as requested by NT EPA. This revised Draft CEMP is an appendix to the SER, detailing the revised management proposed to minimise environmental risk associated with construction actions;
- *Coastal Processes Monitoring and Management Plan (CPMMP)* (Stantec, 2023d): Details the monitoring and management of changes to sedimentation and coastal processes regimes post construction, allowing for risk mitigation strategies to be established.

4 Organisation Structure and Responsibilities

The Proponent and Principal for the project is DIPL. General details are provided in **Table 4-1**.

Table 4-1 Proponent details

Proponent Details	
Name	Department of Infrastructure, Planning and Logistics (DIPL)
Address	Unit 1/35 Export Drive, East Arm, NT 0822
Primary Contact	Shane Dahlhelm – 08 8999 3643 / shane.dahlhelm@nt.gov.au

The construction contractor is yet to be appointed.

The Site Superintendent and Environmental Site Representative / Officer is yet to be appointed. To ensure the objectives of this Draft CEMP are met, defined roles and responsibilities for the Principal and Contractor are listed in Table 4-2.

Table 4-2 Responsibilities

Position	Responsibilities
Principal (DIPL / NTG)	> Comply with the requirements of the Draft CEMP. > Comply with all the legal requirements under the project's approval and relevant legislation. > Ensure environmental factor objectives are met. > Overall responsibility for the project. > Review of ongoing reporting and routine auditing of contractor. > Overall responsibility for complying with relevant legislation, standards and guidelines. > Engagement with stakeholders regarding environmental impacts and progress of construction, including reporting and monitoring.
Contractor(s)	> Implement the requirements of this Draft CEMP. > Comply with all the legal requirements under the project's approval and relevant legislation. > Ensure environmental factor objectives are met. > Complete site works as per technical specifications. > Completion of final CEMP incorporating management actions contained in this Draft CEMP. > Implement monitoring and reporting requirements of CEMP. > Safety of staff, public and the environment. > Reporting daily/weekly reports, incidents, complaints to the relevant bodies.

5 Legislation, Regulations and Standards

5.1 Legislative Context

This Draft CEMP has been prepared to demonstrate the management controls for construction of the project, that will allow the project to conform with relevant environmental legislation. Northern Territory and Commonwealth legislation is in place to stipulate the requirement for environmental risk assessment and management associated with the construction works.

The NT *Environment Protection Act 2019* (EP Act) aims to protect the environment through sustainable development and manage significant disturbances through an environmental approval process. Under the act, the NT EPA regulates the environment impact assessment process to identify potential environmental impacts of development proposals. This Draft CEMP outlines a portion of the environmental risk mitigation measures required for the project to achieve approval under the EP Act.

Core Territory and Commonwealth legislation applicable to the project and this Draft CEMP is summarised in **Table 5-1** and **Table 5-2**, respectively.

Table 5-1 Relevant Territory Legislation

Document	Purpose / Objectives	Agency
Environment Protection Act 2019 (EP Act) and *Regulations 2020* (EP Regulations)	> Protect the environment of the Territory; > Promote ecologically sustainable development so that the wellbeing of the people of the Territory is maintained or improved without adverse impact on the environment of the Territory; > Recognise the role of environmental impact assessment and environmental approval in promoting the protection and management of the environment of the Territory; > Provide for broad community involvement during the process of environmental impact assessment and environmental approval; and > Recognise the role that Aboriginal people have as stewards of their country as conferred under their traditions and recognised in law, and the importance of participation by Aboriginal people and communities in environmental decision-making processes.	Department of Environment, Parks and Water Security
Northern Territory Environment Protection Authority Act 2012 (EP Authority Act)	> Promote ecologically sustainable development; > Protect the environment, having regard to the need to enable ecologically sustainable development; > Promote effective waste management and waste minimisation strategies; and > Enhance community and business confidence in the environmental protection regime of the Territory.	Department of Environment, Parks and Water Security
Waste Management and Pollution Control Act 1998 and *Regulations 1998*	> Protect, and where practicable to restore and enhance the quality of, the Territory environment by: - Preventing pollution; - Reducing the likelihood of pollution occurring; - Effectively responding to pollution; - Avoiding and reducing the generation of waste; - Increasing the re-use and re-cycling of waste; and - Effectively managing waste disposal;	Department of Environment, Parks and Water Security

Document	Purpose / Objectives	Agency
	> Encourage ecologically sustainable development; and > To facilitate the implementation of national environment protection measures made under the National Environment Protection Council (Northern Territory) Act 1994 (described below).	
Marine Pollution Act 1999 and *Regulations 2003*	The overall purpose of this Act is to protect the Territory's marine and coastal environment by minimising intentional and negligent discharges of ship-sourced pollutants into coastal waters. This purpose is to be achieved primarily by giving effect to relevant provisions of the following annexes of MARPOL: > Annex I (which deals with pollution by oil); > Annex II (which deals with pollution by noxious liquid substances in bulk); > Annex III (which deals with pollution by harmful substances in packaged form); and > Annex V (which deals with pollution by garbage). The purpose is also to be achieved by: > Providing an approach to protecting the Territory's marine and coastal environment from ship-sourced pollutants complementary to the approach of the Commonwealth and the States of the Commonwealth; > Making provision about the discharge of sewage from ships; > Enabling shipping casualties that are polluting, or threatening to pollute, coastal waters, to be dealt with; and > Imposing severe penalties on persons who pollute the Territory's marine and coastal environment in contravention of this Act.	Department of Environment, Parks and Water Security
National Environment Protection Council (Northern Territory) Act 1994	The object of this Act is to ensure that, by means of the establishment and operation of the National Environment Protection Council: > People enjoy the benefit of equivalent protection from air, water or soil pollution and from noise, wherever they live in Australia; and > Decisions of the business community are not distorted, and markets are not fragmented, by variations between participating jurisdictions in relation to the adoption or implementation of major environment protection measures.	Department of Environment, Parks and Water Security
Territory Parks and Wildlife Conservation Act 1976 and *Regulations 2001*	> Provides for the protection, conservation and sustainable utilisation of wildlife; and > Provides protection of listed threatened species for which proponents must consider direct and indirect impacts on a listed threatened species or place covered under this Act.	Department of Environment, Parks and Water Security
Water Act 1992 (Water Act) and *Regulations 1992*	> Provides for the investigation, allocation, use, control, protection, management and administration of water resources, including extraction of groundwater, waste water management and water pollution; and	Department of Environment, Parks and Water Security

Document	Purpose / Objectives	Agency
	> Provides for water allocation plans, drilling licences, bore construction permits, water extraction licences, waste discharge licences, fees and charges, and penalties for offences against the Act.	

Table 5-2 Relevant Commonwealth Legislation

Document	Purpose / Objectives	Agency
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	> Provides for the protection of the environment and conservation of biodiversity, particularly species and places of national significance; and > Invoked only if a development is likely to have environmental impacts of national significance.	Australian Government Department of Agriculture, Water and the Environment
National Environment Protection Measures (Implementation) Act 1998 and *Regulations 1999* (NEPM)	The objects of this Act are: > To make provision for the implementation of national environment protection measures in respect of certain activities carried on by or on behalf of the Commonwealth and Commonwealth authorities; > To protect, restore and enhance the quality of the environment in Australia, having regard to the need to maintain ecologically sustainable development; andTo ensure that the community has access to relevant and meaningful information about pollution.	Australian Government Department of Agriculture, Water and the Environment
National Environment Protection (Assessment of Site Contamination) Measure 1999	The purpose of the Measure is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community which includes regulators, site assessors, environmental auditors, land owners, developers and industry. The desired environmental outcome for this Measure is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.	Australian Government Department of Agriculture, Water and the Environment

5.2 Other Relevant NT Legislation

- *Aboriginal Land Act 1978*
- *Bushfires Management Act 2016*
- *Building Act 1993*
- *Dangerous Goods Act 1998*
- *Environmental Assessment Act 1982*
- *Environmental Offences and Penalties Act 1996*
- *Fire and Emergency Act 1996*
- *Heritage Act 2011*
- *Northern Territory Aboriginal Sacred Sites Act 1989*
- *Ports Management Act 2015*
- *Soil Conservation and Land Utilisation Act 1969*

- *Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010*
- *Weeds Management Act 2001*
- *Work Health and Safety (National Uniform Legislation) Act 2011*

5.3 Northern Territory Regulations

- Building Regulations
- Dangerous Goods Regulations
- Environmental Offences and Penalties Regulations
- Fire and Emergency Regulations
- Heritage Regulations
- Territory Parks and Wildlife Conservation By-Laws
- Territory Parks and Wildlife Conservation Regulations
- Transportation of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations
- Weeds Management Regulations
- Work Health and Safety (National Uniform Legislation) Regulations

5.4 Other Relevant Federal Legislation

- *Aboriginal and Torres Strait Islander Act 2005*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Aboriginal Land Rights (Northern Territory) Act 1976*
- *Native Title Act 1993*
- *National Environment Protection (Ambient Air Quality) Measure 1998*
- *Fuel Quality Standards Act 2000*

5.5 Federal Regulations

- *Aboriginal and Torres Strait Islander Heritage Protection Regulations*
- *Aboriginal Land Rights (Northern Territory) (Land Description) Regulations*
- *Aboriginal Land Rights (Northern Territory) Regulations*

5.6 Australian Standards

- AS/NZS/ISO 14001 Environmental Management Systems - Requirements with Guidance For Use
- AS 1940 – 2004 The Storage and Handling of Flammable and Combustible Liquids
- AS1692 – 2006 Steel Tanks for Flammable and Combustible Liquids
- AS490-2009 Protection of Trees on Development Sites
- AS 2436 Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites
- AS 3745-2010: Planning for Emergencies in Facilities

5.7 Other Standards

- ASTMD 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

- ASTMD 7208-6 - Standard Test Method for Determination of Temporary Ditch Check Performance in Protecting Earthen Channels from Stormwater-Induced Erosion
- Code of Practice for Small On-Site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent November 1996
- The Australian Dangerous Goods Code Edition 7.4

5.8 ANZECC Publications

- ANZECC Australian Guidelines for Water Quality Monitoring and Reporting
- ANZECC Guidelines for Fresh and Marine Water Quality

5.9 Other Publications

- Standard Specification for Environmental Management: Version 2.0
- International Erosion Control Association (IECA) Australasia Best Practice Erosion and Sediment Control
- Queensland Maroon Book for Urban Storm Water Management - Manual for Erosion & Sediment Control, Version 1.2, Sunshine Coast Regional Council
- Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines, Version 4, SE Dear, LE O'Brien, AE McElnea, NG Moore, SK Dobos, KM Watling and CR Ahern
- RTA Code of Practice for Water Management
- Environmental Noise Management Manual
- Soil Survey Standard Test Method, Unified Soil Classification System: Field Method
- Spray Drift Fact Sheet-APVMA
- QLD Standard Work Method for the Assessment of the Lawfulness of Releases to Waters from Construction Sites
- Australian Rainfall and Runoff – Flood Analysis and Design
- Declared Weeds of the Northern Territory
- Weeds of National Significance (WONS)
- DLRM Land Clearing Guidelines NT Planning Scheme 2010
- NT EPA - Noise Guidelines for Development Sites in the Northern Territory
- NT EPA - Keeping our Stormwater Clean – a Builder's Guide
- NT EPA – Prevent Pollution from Building Sites
- NT WorkSafe – How to Safely Remove Asbestos – Code of Practice
- NT WorkSafe - Managing the Work Environment and Facilities – Code of Practice
- Safe Work Australia's Emergency Plans Fact Sheet

6 Approvals, Licences and Permits

The following approval, licences and permits are in place, being sought or to be obtained prior to construction works.

Aboriginal Areas Protection Authority Certificate

DIPL holds AAPA Certificate C2019/067 which covers the area of which the construction of landside and offshore works falls within. The certificate lists two restricted work areas (RWA1 & RWA2) which lie to the south of the proposed works (Refer to Figure 2-3).

Development Consent

The activity requires development consent under the *NT Planning Act 1999*. A copy of the Development Permit will be provided to the Contractor. All work must comply with the conditions of this Development Permit.

Clearing Permit

If clearing in an adjacent lot outside of the area zoned Main Roads, a clearing permit will be required to be obtained by the Contractor. The project requires a development application which is currently at the assessment stage. The area of lot 116 Zoned M (Main Roads) in Figure 2-3 has been included as being cleared and then rehabilitated as part of the projects Development permit.

Environmental (NT EPA) Approval

The project requires approval by the NT EPA, due to its potential for environmental impact, as per the *Environmental Protection Act 2019*. The Environment Referral was submitted in early 2022, it has progressed to assessment by supplementary environmental report to be submitted in early 2023 as the project progresses to the Design and Construction stage. A copy of the Approval and Conditions will be provided to the Contractor.

Harbourmaster Consent

Consent from the Harbourmaster (DIPL) to undertake development in the coastal zone, as per the *Ports Management Act 2015*.

Power and Water Corporation (PWC) Consent

To be obtained by the contractor as required.

Approval from Department of Health (DoH) for on-site effluent disposal system and/or certification from a licenced plumber

To be obtained by the contractor as required.

Registration with DoH for a camp commercial food preparation area in accordance with the *Food Act 2004*

To be obtained by the contractor as required.

DIPL's Environment Services Branch endorsement of the Final CEMP

Contractor to prepare and submit final CEMP for approval.

7 Community Consultation and Complaints Handling

Unless the work is of an urgent nature for safety reasons, notification of residents must be at least 5 working days before commencing the work and must advise of the following:

- The nature of the work;
- Why it is necessary;
- The expected duration;
- Changes to arrangements for traffic or property access; and
- The name and 24 hour contact telephone number of the Contractor's representative who can respond to resident concerns.

Within 1 working day of receiving a complaint about any environmental issue, including pollution, the Contractor will supply a written report to the DIPL Superintendent detailing the complaint and action taken to alleviate the problem. A register of all such complaints will be maintained, together with the following records:

- Date and time of complaint;
- The method by which the complaint was made (telephone, letter, meeting, etc.);
- Name, address, contact telephone number of complainant (if no such details were provided, a note to that effect);
- Details of complaint;
- Action taken in response including follow up contact with the complainant;
- Any monitoring to confirm that the complaint has been satisfactorily resolved; and
- If no action was taken, the reasons why no action was taken.

8 Non-Conformance

The Contractor shall provide details of how Non-Conformances will be managed in the final CEMP.

A failure to comply with, or a breach of, any condition will result in the issue of an Instruction to Contractor, or a Corrective Action Request, or a Non-Conformance Report or any combination of these.

9 Corrective Action Process

The Contractor shall provide details of how Corrective Actions will be managed in the final CEMP. This is to include management system used and methods for closing out and reporting on the identified Non-Conformances. Corrective Actions are detailed further in **Section 14** for specific construction and management activities.

10 Monitoring

Required monitoring for the works entails:

- Full site walkover of the construction site, prior to the commencement of works each day;
- The site walkover should identify any evidence of reptiles (presence), mammals (presence) and shorebirds (presence, nesting). Photographs of this and other fauna present should be taken, and the occurrence immediately reported to DIPL's environmental representative for the project, for advice prior to work commencing;
- Photographs of access, laydown and stockpile areas should be taken at the commencement and completion of works to demonstrate no additional degradation of vegetation or appropriate reinstatement;
- Photographs and site inspection of reused (i.e. dredged) and imported rock material to demonstrate that it appears clean and is free of any debris or visible contamination such as spilt oil;
- Photographs should be taken of the full site at the completion of works, demonstrating that required reinstatement and rehabilitation has been achieved;
- Records of environmental monitoring are to be maintained, including the effectiveness of any corrective action taken; and
- Records of environmental monitoring are to be included in claim reports for each campaign and are to be made available to the DIPL Superintendent or Environmental Officer upon request.

Specific monitoring / rehabilitation requirements are further outlined in **Section 14**.

11 Auditing

Self-auditing of environmental management compliance is to be undertaken by the contractor on a monthly basis, to be reviewed by DIPL's Superintendent and Environmental Officer. The contractor is to develop and implement a risk-based, self-auditing program to verify that all works comply with the *DIPL Environmental Standard Specification*, relevant legislation (**Section 5**), approvals/licences/permits (**Section 6**) and this Draft CEMP.

The audits are to be based on the key risks identified in the Environmental Risk Assessment (see **Section 14**) and should demonstrate achievement of specific performance indicators described in **Table 14-2**. The auditing should include records of community consultation and complaints handling (**Section 7**), monitoring (**Section 10**) and staff training and inductions (**Section 12**).

The Contractor will maintain records of the results of environmental audits including Non-Conformances and the effectiveness of any remedial action taken. Records of environmental audits are to be made available to the DIPL Superintendent and/or Environmental Officer upon request. DIPL will also undertake independent audits at any time.

12 Environmental Training and Induction

All site staff, sub-contractors and visitors will be subject to and made aware of the site CEMP, environmentally sensitive areas, identified cultural sites of significance, Sacred Sites or Restricted Works Areas (RWAs) and environmental responsibilities.

All site staff, sub-contractors and visitors will be required to undertake a site-specific induction.

A checklist will be developed by the Contractor to demonstrate environmental training and induction. The checklist for induction should include the following:

- Read and understand the Contractor's Environmental Management Plan;
- Demonstrate procedure for pre- and post-work monitoring;
- Understanding of each environmental risk associated with the works and the mitigation measures and monitoring in place;
- Review approved access routes, extraction and deposition areas, RWA's and any conditions associated with approvals and certificates to be adhered to; and
- Procedure and contact details for DIPL's Environmental Officer in the event of an environmental impact.

13 Emergency Management

The contractor is responsible for the preparation of Emergency Management Plan(s) to prepare for the risk of, and need to respond to:

- Fire, both internally or externally generated;
- Adverse weather, largely focusing on the risk of cyclone;
- Spills and contamination;
- Site evacuation; and
- Medical emergency.

The planning should outline, as a minimum:

- Source of information/monitoring to alert of emergency;
- Specific response actions to take in the case of an emergency;
- Responsible person(s) for coordinating response;
- Contact details for key personnel and emergency services; and
- Site and location maps (evacuation routes, muster points, storage areas for dangerous goods and chemicals, egress, spill kits, hydrants, first aid locations, closest medical services etc.).

Establishment of the work site and emergency management planning is to comply with:

- *Fire and Emergency Act 1996*
- Managing the Work Environment and Facilities – Code of Practice (NT Worksafe, 2020)
- AS 3745-2010: Planning for Emergencies in Facilities; and
- Safe Work Australia's Emergency Plans Fact Sheet.

14 Risk Assessment

14.1 Risk Assessment Framework

An environmental risk assessment has been carried out for the project design to meet the requirements of the EP Act and to inform self-assessment under the EPBC Act. This overall project risk assessment is detailed in the *Environmental Referral Report* (Cardno, 2022b). The NT EPA's environmental factors have been used to determine project actions with the potential to impact the environment. Factors have been developed to improve certainty and transparency within the environmental impact assessment process and have been grouped into five themes; Land, Water, Sea, Air and People. Themes, and underlying factors, relevant to construction actions are listed in **Table 14-1**. The Contractor will update the risk assessment in the final CEMP prior to commencing construction.

Table 14-1 Relevant NT EPA environmental factors relevant to construction activities for the project

Theme	Factor	Environmental Objective
LAND	Terrestrial environmental quality	*Protect the quality and integrity of land and soils so that environmental values are supported and maintained.*
	Terrestrial ecosystems	*Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning*
WATER	Inland water environmental quality	*Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.*
SEA	Marine environmental quality	*Protect the quality and productivity of water, sediment and biota so that environmental values are maintained.*
	Marine ecosystems	*Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.*
AIR	Air Quality	*Protect air quality and minimise emissions and their impact so that environmental values are maintained.*
	Atmospheric processes	*Minimise greenhouse gas emissions so as to contribute to the NT Government's goal of achieving net zero greenhouse gas emissions by 2050.*
PEOPLE	Community and economy	*Enhance communities and the economy for the welfare, amenity and benefit of current and future generations of Territorians.*
	Cultural heritage	*Protect sacred sites, culture and heritage.*
	Human health	*Protect the health of the Northern Territory population.*

A risk assessment has been carried out under each environmental factor, identifying:

- Environmental aspect;
- Risk pathway(s);
- Potential impacts;
- Likelihood, consequence and derived risk rating;
- Risk management and mitigation measures; and
- The residual risk rating and level of certainty for this.

The full environmental risk assessment table is provided in **Appendix A** and the assessment is discussed in detail in the *Environmental Referral Report* (Cardno, 2022b). A summary of the table, for environmental aspects relevant to construction activities, is provided below in **Table 14-2**.

Table 14-2 Risk assessment summary table relevant to construction activities

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Environmental Factor: Terrestrial Environmental Quality					
Exposure of contaminants during earthworks	> Construction activities – disturbance, excavation of soils > Exposure of potential Acid Sulfate Soils (ASS) > Exposure of potential metals or hydrocarbons > Exposure of asbestos containing soil	> Reduction in soil quality, stability and fertility > Impact to human health and surrounding terrestrial ecosystem > Contaminated runoff discharging into marine ecosystem	**Medium**	> Assessment of areas for contaminants of potential concern (e.g. asbestos) > Identification and removal of known contaminants prior to proceeding > Stop works if suspected contaminated soils or material encountered and further investigate > Limit the area of exposed earth and period of exposure	**Low**
Contaminants released during construction activities	Spills/leaks of petrol, oils, lubricants, hazardous materials, paints, thinners and litter	Adverse impact on soil quality within and adjacent to project footprint	**Medium**	Contractor to develop a Hazardous Material Management Procedure including but not limited to the following: > Ensure stockpiles of bulk materials are well contained separated from exposed soils; > Training for personnel in implementation of safe work practices to minimise risks and impacts of spillage of fuels, chemicals and other contaminants; > Record and report all POL, chemical and hazardous substance spills; and > Ensure personnel have access to spill kits that contain an absorbent material and contaminated disposal sites.	**Low**
Clearing areas of existing vegetation	Removal of vegetation and topsoil leaves area susceptible to erosion	> Loss of topsoil during overland flows > Eroded topsoil causing sedimentation in marine environment	**Medium**	> All clearing to be undertaken in accordance with Land Clearing Guidelines (DENR, 2019) and defined in CEMP > Cleared land outside of the direct footprint is to be rehabilitated using appropriate soils and vegetation > Ongoing rehabilitation during construction > Appropriate drainage design to prevent ongoing erosion issues	**Low**
Environmental Factor: Terrestrial Ecosystems					

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Removal of vegetation due to land clearing of site for construction footprint and temporary work areas	Removal of native flora including: > Eucalyptus species > Open woodland, and > Open grassland	Loss of biodiversity on the Cox Peninsula	**Medium**	> Land clearing only to be undertaken in approved areas and as per NT land clearing guidelines > Avoidance of significant and valuable vegetative communities > Any areas temporarily cleared are to be rehabilitated using native seed	**Low**
Clearing of potential fauna habitat for construction footprint and temporary work areas	Removal of fauna habitat	Injury of death of fauna or destruction of habitat	**Medium**	> Land clearing only to be undertaken in approved areas and as per NT land clearing guidelines > Pre-clearance relocation of identified fauna	**Low**
Noise, vibrations and lighting at Mandorah due to construction activities	Noise, vibrations and lighting impacting fauna	Loss of habitable area for fauna	**Low**	> Contractor to develop a Noise Management Plan > Lighting only focused on works, not surrounding habitat, light shields if needed > Construction activities will comply with the requirements of the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds 2020 (Commonwealth of Australia, 2020) and the procedures outlined in **Table 14-19**	**Low**
Fire ignition due to construction activities	Uncontrolled fire	Loss or damage to terrestrial ecosystems	**Medium**	Contractor to develop a Fire Management Plan	**Low**
Dust generation due to construction activities	Generated dust settling on terrestrial ecosystems	Adverse health impacts to local flora if dust settles on foliage	**Medium**	Contractor to develop a Dust Management Plan including but not limited to the following: > Watering of temporary roads and stockpile areas; > Watering down affected vegetation; > Use of dust suppression equipment; and > Speed limits within on site roads.	**Low**
Vehicular movement into site carrying weed species	Introduction of weeds to site	Loss of native biodiversity on the Cox Peninsula due to pressure from introduced species	**Medium**	Contractor to develop a Weed Management Plan including but not limited to the following: > Review and relevant weed mapping and signpost areas of significant weed infestation; > Vehicle washdown stations; and > Routine monitoring of infestations and controls.	**Low**

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Application of water as a dust control measure	Contaminated water from water storage facilities or dust suppression measures adversely impacting vegetation	Loss of vegetation if contaminants leach into soils	**Low**	> Water storage facilities to be located away from vegetation > Water used for dust suppression shall be of suitable quality	**Low**
Increased vehicle traffic during construction activities	Increased likelihood of vehicle strike	Death or injury to fauna	**Medium**	> Training for all drivers and operators on local fauna most likely to be encountered > Suitable speed limits into and around site	**Low**
Asbestos contamination encountered on Lot 50	Expose asbestos fibres to ecosystems	Adverse health impacts to local fauna	**Low**	> Asbestos removal occurring in early works. > If asbestos is encountered when clearing Lot 50, material is to be removed and disposed of by trained personnel	**Low**
Environmental Factor: Inland Water Environmental Quality					
Construction of expanded carpark and ferry terminal adding to the impermeable surfaces	Increase in the quantity of surface water runoff	Localised flooding	**Low**	No treatment needed. Runoff flows directly into Darwin Harbour in pre- and post-development scenarios	**Low**
Environmental Factor: Marine Environmental Quality					
Disturbance of marine sediments (fines)	Rock placement and piling	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	**Medium**	> Model dredging and disposal actions to properly understand dredge plume dispersion > Gain an understanding of background conditions > Gain an understanding of sensitive marine environmental receptors and their tolerance > Control actions to maintain water quality below appropriate thresholds	**Low**
Release of contaminants from marine sediments	Rock placement and piling	> Toxic contaminants made available to marine ecosystem for biological uptake and bioaccumulation	**Medium**	> Characterise material to be disturbed to understand locations and levels of contamination > Assess levels of contamination against appropriate thresholds, given the nature of the receiving environment > Isolate, remove and confine areas where contamination is potentially toxic to the marine environment	**Low**

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
		> Potential impact to ecosystem health			
Introduction of contaminants/pollution to marine environment	Construction activities - inappropriate waste disposal, accidental oil/chemical spill	> Toxic contaminants introduced to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	**Medium**	> Inspection and audit of vessels and plant, outlined in DSDMP and CEMP > Reporting and response protocols should a spill occur - oil/chemical spill response etc.	**Low**
Release of sediments from land	Disturbance/stockpiling of material on land, lost due to run-off, wind etc.	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	**Medium**	Controlled by CEMP: > Appropriate stockpiling technique and location; > Prevention by bunding, erosion control etc; and > Response plan for release of material.	**Low**
Environmental Factor: Marine Ecosystems					
Vessel movement during construction (e.g. piling barge)	> Vessel strike of marine fauna such as dugongs, turtle, dolphin > Underwater noise impacts due to piling > Direct impact to seabed - marine ecosystems	> Vessel strike of marine fauna > Injury to marine fauna > Damage to ecosystems	**Medium**	> Vessel movement controls, speed limits, no-go zones > Marine fauna observation and avoidance > Piling controls (soft start) to allow fauna to leave area	**Low**

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Construction activities including earthworks, building works and transport to site	Construction materials and /or general litter entering marine environment	> Ingestion/injury of waste by marine fauna > Damage to marine ecosystems	**Medium**	> Control of waste as per CEMP > Reporting and response to pollution events > Control of construction access/activities	**Low**
Rock placement and piling	Direct removal of benthic communities and habitat	Permanent removal/destruction of BCH such as seagrass and coral	**High**	> Characterise BCH in direct impact footprint > Minimise footprint and avoid sensitive receptors/important BCH where possible	**Medium**
Rock placement and piling	Elevated suspended sediment concentration (turbidity) in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (blocking of light) > Impact to marine fauna due to ingestion/dermal contact	**High**	> Characterise BCH in vicinity of project > Characterise dredge plume dispersion to understand changes to water quality with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	**Low**
Rock placement and piling	Sedimentation of seabed in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (smothering)	**High**	> Characterise BCH in vicinity of project > Characterise dredge plume dispersion to understand sedimentation levels with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	**Low**
Environmental Factor: Air Quality					
Dust generated by construction activities including earthworks, building works and transport to site.	Decrease in local air quality	Impacts to local fauna and human health through inhalation of particles	**Medium**	Integration of dust management measures in construction management plan including: > Watering of temporary roads and stockpile areas; > Use of dust suppression equipment; and > Speed limits on site roads.	**Low**

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Mobile plant at site and trucking of materials to site	Carbon dioxide emissions	Impacts to local fauna and human health through inhalation of emissions	**Medium**	Integration of air quality measures in construction management plan including: > Isolating plant from workers where possible; and > PPE	**Low**
Environmental Factor: Atmospheric processes					
Energy usage during construction of facilities	Direct emissions from mobile plant, dredger, generators etc.	Cumulative impact of carbon emissions to global climate change	**Medium**	> Efficiency in design to minimise quantity of rock needed in breakwaters, causeway and boat ramp > Materials should be transported to site with the minimum number of vehicles required > Reuse of existing building onsite for ferry terminal to reduce new materials required	**Low**
Future power usage at the ferry terminal	Indirect emissions from use of electricity	Cumulative impact of carbon emissions to global climate change	**Medium**	> Integration of electricity reduction measures in construction management plan including > Energy saving devices > Consideration of alternative energy sources where possible	**Low**
Environmental Factor: Community and the Economy					
Construction activities including earthworks and building works	Noise generated	Decrease in liveability for nearby residents, ferry users or tourists	**Medium**	Integrate noise management measures within the construction management plan	**Low**
Trucking in of construction materials	Increase in traffic along Cox Peninsula Road and Charles Point Road	Traffic delays and increased risk of accident for local residents of the Cox Peninsula	**Medium**	> Traffic management plan to be implemented to manage any disruptions to local traffic > Staggering of heavy vehicles throughout the day to minimise congestion	**Low**
Construction activities including earthworks and building works	Loss of access to existing carpark	Decrease in liveability for users of existing boat ramp or carpark	**Medium**	Stakeholder engagement with current uses of facilities to inform of access issues during construction	**Medium**
Environmental Factor: Culture & Heritage					

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
Aboriginal sacred sites	Construction activities disturbing or destroying aboriginal sacred sites	Permanent or temporary damage or contamination of Sites	**Medium**	Response and reporting procedures should a site or object be encountered	**Low**
Heritage/archaeological sites	Construction activities disturbing or destroying: construction activities disturbing or destroying	Permanent or temporary damage or contamination of Sites	**Medium**	Response and reporting procedures should a site or object be encountered	**Low**
Environmental Factor: Human Health					
Asbestos contamination encountered on Lot 50	Inhalation of airborne asbestos	Adverse health impacts to site workers and users of facility	**Medium**	> Staff to have sufficient training in handling asbestos > Appropriate PPE provided to all staff working with, or suspected to be working with asbestos	**Low**
Personnel working outside	Exposure	> Sunburn and heat stress > Injury due to cyclone or storm whilst on site	**High**	> Staff to have appropriate PPE (long sleeved shirt, pants, hats, sunscreen etc.) to minimise risk of sunburn and heat stress > First aid kits located around site for initial response > Development of a cyclone response plan and regular monitoring of local news channels	**Medium**
Personnel working outside	Biting insects, snakes, crocodiles	> Injury due to bite/attack > Disease transmitted by biting insect	**Medium**	> Staff to have appropriate PPE (long sleeved shirt, pants, repellent etc.) to minimise risk of biting insects > Staff to have sufficient training on the identification of reptiles likely to be encountered on site > If a problem crocodile is encountered it should be reported to (08) 8983 2475 > First aid kits located around worksite to provide initial response to incidents	**Medium**
Construction activities including earthworks and building works	Open fire ignited by construction activities	> Minor, serious or fatal burns to personnel	**Medium**	> Staff to have sufficient training in fire management > Fire extinguishers located around site	**Medium**

Environmental Aspect	Risk Pathway(s)	Potential Impacts	Risk Rating	Risk Management / Mitigation	Residual Risk Rating
		> Smoke inhalation		> Smoking and hot works in permitted areas only	
Proximity to vegetation	Exposure to bushfire	> Minor, serious or fatal burns to personnel > Smoke inhalation	**Medium**	> Creation of a bushfire evacuation plan > Staff to have sufficient training in fire management > Regular monitoring of local news channels	**Low**
Public accessing breakwaters and / or jetty during construction	Slip, trip or fall into water above head height	Accidental entry to deeper water leading to drowning hazard	**Medium**	Fencing and signage to prevent public access to breakwater and jetty	**Medium**
Emissions from construction plant	Exposure of workers to emissions	Irritation to workers	**Medium**	> Avoiding idling of construction plant > Isolating workers from fumes > PPE such as masks and face shields > Alternative power source	**Low**

14.2 Management of Identified Risk

Tables within the following subsections detail specific management strategies for construction activities or management focuses. As per DIPL's Contractor's Environmental Management Plan Template, the tables detail:

- Controls (of environmental risk);
- Performance indicators;
- Monitoring;
- Reporting; and
- Corrective actions.

The controls have been developed to manage identified risk to environmental factors, described in **Table 14-2**.

14.2.1 Earthworks and Excavation

Various earthworks and excavation activities are anticipated to be involved in the project, including to:

- Prepare areas for new development and site use (e.g. carparks, roads, paths);
- Adjust land levels to convey access from land to maritime facilities;
- Transfer and place materials for construction of breakwaters, boat ramp and causeway; and
- Excavate to install drainage and services.

Control of environmental risk for these actions is *Soil Conservation and Land Utilisation Act 1969* and as outlined in **Table 14-3**.

Table 14-3 Earthworks and Excavation Management Strategy

Management Strategy	Details
Control(s)	> Nominated earthworks and excavation areas are covered under AAPA C2019/067 and all permissions and licences to access the land are in place; > Abide by all conditions and guidelines within the relevant AAPA certificate, with strict avoidance of Restricted Work Areas (RWAs). These areas are to fenced and signed as part of site setup; > Development Approval (once received) and Clearing Permit conditions to be adhered to; > EPA Approval conditions (once confirmed) to be adhered to; > Proposed site layout to be defined in GIS for the approval of the DIPL Superintendent before commencement of works; and > DIPL's standard requirements for the operation of excavation areas are as follows: <u>Access</u> - Construct only one access road to each area. Additional access roads require written approval from the Superintendent prior to construction; - Confine all transport operations to the access road, the stockpile area, the site of the works and/or existing public roads; and - Provide and maintain adequate road drainage to the access road.

Management Strategy	Details
	Limit of excavation - Not within 6 m of any fence line or utility service line or point; - Not within any gas pipeline easement; - Not within 125 m of any road or railway centre line; - Not within 25 m of a water course (refer to Northern Territory Land Clearing Guidelines 2019 for water course buffers); - Not within 200 m of a defined waterway crossing; and - Not within vegetative buffers. Extraction - Stockpile cleared vegetation for use in rehabilitation; - Strip 100 mm depth top layer throughout the works area and stockpile; - Stockpiled material to be clear of drainage lines, and other vegetated areas, to a maximum height of 2 m; - Side slopes of sand or gravel to be no steeper than one vertical to two horizontal at any time when the works are unattended, alternatively benching of vertical batters is acceptable; - Remove by-products of the works unless otherwise specified; and - Progressively rehabilitate works areas no longer in use. > No deviation from the above requirements will be permitted without written approval from the DIPL Superintendent to proceed. > The Department require an Earthworks Management Plan be developed for the project, due to proximity to public facilities. The Plan is to provide detail as to how the Contractor plans to clear, restrict, maintain and rehabilitate temporary works areas during the life of the project. The Plan is to include, as a minimum, diagrams showing the works areas, location of stockpile sites, drainage lines and location and type of erosion and sediment controls, public access restriction and details regarding works staging and rehabilitation. > Rehabilitation of temporary works areas is to be undertaken as per Rehabilitation of Extraction Areas, Detours and Access Tracks outlined in the Environmental Management Standard Specifications and ensuring rehabilitation follows the procedures outlined under the rehabilitation section of this draft CEMP (Section 14.3).
Performance Indicator(s)	> All works activities remain restricted to areas approved under AAPA. Development Approval and Clearing Permit. > No complaints received from AAPA/Land Council/ Landowner. > Works areas remain at the approved size, no over clearing occurs. No clearing occurs within the buffered ‘no-go’ zones around waterways. > Rehabilitation activities have completed prior to the on-set of the Wet Season where practicable. > Success criteria and closure objectives are met. > No loss or destabilisation of stockpiles.

Management Strategy	Details
	> No incidence of public entry to works areas.
Monitoring	Works site management audited weekly by site supervisor/HSE officer. Progressive rehabilitation activities monitored on a weekly basis by DIPL Environment Officer.
Reporting	Project Manager/HSE Officer to provide NCR to DIPL within 24 hours of identification. Provide monthly progress report on rehabilitation to DIPL. Weekly construction progress report to note work areas in use, rehabilitated areas and areas proposed to commence rehabilitation.
Corrective Action(s)	In instances of over clearing, immediately rehabilitate over cleared area. Provide a report, with photos, to DIPL Superintendent. Re-establish/re-flag clearing limits on site. Undertake toolbox meeting to discuss clearing limits. Access to RWAs – Immediately cease work and report to DIPL/NLC for advice. Further training and prevention of access. If public access restricted worksite, increase barriers/security and signage.

14.2.2 Water Extraction

Available groundwater at the project site is known to be limited. It is likely that the contractor will need to obtain water offsite, nearby. Control of environmental risk for potential water extraction is to be as per the *Water Act 1992* and as outlined in **Table 14-4**.

Table 14-4 Water Extraction Management Strategy

Management Strategy	Details
Control(s)	> Permission to access water points has been granted by Power and Water. > NTG Road Bores are to be utilised where possible, and where not practical, private/pastoral bores may be nominated. Any approval to access private or leasehold land to extract water from a bore is the responsibility of the awarded contractor. > Notify the DIPL Superintendent of the location, expected water use and how it will be extracted for each and every proposed occasion. This must be done prior to extracting any water. The DIPL Superintendent will review the information prior to providing approval. Do not extract water until approval is granted. > For all water bodies, ensure that any water extraction will not reduce the supply utilised by local landholders and the environment, to the point where such users are adversely affected. For all water bodies, ensure that any water extraction will not reduce the supply to the natural environment to the point where the natural environment is adversely affected. The general guideline is that only 20 % of any flow in a river or 20 % of any standing water body should be used in the Top End and 5 % for Southern Regions. Generally, construction of sumps or dams is not permitted.

Management Strategy	Details
	> Where a standing water body is less than 500 mm deep or extraction from the water body (river or waterhole) is likely to exceed 20 % as detailed above, source an alternative water supply. > Protect the banks and beds of any waterhole or river used for water extraction. Any damage is to be repaired immediately. Pads and tracks likely to contribute to erosion must be rehabilitated. > No fuels, lubricants or equipment, other than pumping equipment are permitted to enter or remain at the water body. > If significant water is to be extracted outside of the project site, from a previously unused location, further environmental risk assessment is required. > Non-permeable bunding in accordance with Australian Standard (AS 1940 – 2004) is to be provided around pump/generator equipment.
Performance Indicator(s)	> All water extraction is in accordance with approval, licence permission obtained. > No incidence of reduction in streamflow or availability of water to surrounding environment and landowners in accordance with percentages above. > No incidence of release of chemicals to environment.
Monitoring	> All extraction volumes and timing to be recorded. > Streamflow, usage and rainfall data to be monitored.
Reporting	> All extraction volumes, locations and timing to be reported to DIPL Superintendent in weekly report.
Corrective Action(s)	> Immediately cease extraction if allocation exceeded or depletion is in excess of permitted. > Discuss further action with PWC and DIPL Superintendent. Import of water to replenish may be necessary.

14.2.3 Marine Construction Activities

The major marine construction activity for the project is dredging, the environmental risk of which is managed through the Draft DSDMP (Cardno, 2022a). Additional marine construction activities not managed by the Draft DSDMP, to be covered in this Draft CEMP, include:

- Installation of rock structure in the nearshore environment, including breakwaters, boat ramp and causeway; and
- Installation of maritime facilities such as jetty, gangway and pontoon.

Control of environmental risk for these activities is to be as per the *Ports Management Act 2015* and as outlined in **Table 14-5**.

Table 14-5 Marine Construction Activities Management Strategy

Management Strategy	Details
Control(s)	> Marine mammal observation and monitoring, to be undertaken as per the Draft DSDMP during all marine construction works with observer located on a vessel or on land; > Water quality monitoring in the vicinity of the project footprint and at reference sites (as per Draft DSDMP) to be retained during construction of breakwaters; > Piling controls (soft start) to allow fauna to leave area (as per Draft DSDMP) > Adherence to an invasive species management framework for all imported marine plant such as piling barges (as per Draft DSDMP); > All imported material to be placed in the marine environment are inspected and washdown if deemed necessary by the Superintendent. > Appropriate spill response and pollution control for plant working near or over water. > All rocks are placed in proposed construction layout, working outwards from land. > Temporary bunding is installed between works and construction stages so that finer core materials and nearshore stockpiles are not released to the marine environment.
Performance Indicator(s)	> No incidence of interaction between construction activities and marine fauna; > No pollution, spills or excessive sedimentation associated with marine construction activities – particularly breakwater construction. > No irreversible damage to marine environment outside of direct construction footprint. > All construction is within the design footprint.
Monitoring	> Water quality sites established to monitor dredging (commencing prior to breakwater construction) are to remain in place during breakwater construction, with the same thresholds and responses in place (see Draft DSDMP). > Marine fauna observations as per DSDMP during all marine construction activities (with requirements to pause work for certain proximity of fauna – see Draft DSDMP).
Reporting	> Ongoing water quality reporting, as per Draft DSDMP; > Reporting of all marine fauna observations, as per Draft DSDMP; > Weekly reporting of construction activities to compliance with performance indicators above.
Corrective Action(s)	> Pause construction works and review methodology if marine threshold triggers (water quality, marine fauna) exceeded; > If imported material contaminated – cease import and seek alternative supply; > If construction or damage outside of proposed marine footprint, cease work and review construction methodology.

14.2.4 Cultural Heritage Management

The project has the potential to encounter unknown heritage items and sites associated with both Aboriginal and European (e.g. WWII artefacts) cultural heritage. All known heritage sites have been identified and appropriate exclusion zones or restricted work areas established. Management of risk to cultural heritage is to be as per the *Aboriginal Land Act 1978*, *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, *Heritage Act 2011* and as outlined in **Table 14-6**.

Table 14-6 Cultural Heritage Management Strategy

Management Strategy	Details
Control(s)	> DIPL have received an Authority Certificate from the Aboriginal Areas Protection Authority (AAPA) for works associated with the Project. The Authority Certificate identifies two Restricted Works Areas (RWA's) that protect known Aboriginal Sacred Sites and are not within the project footprint. > AAPA certificate(s) provide the Department and its Contractor, including sub-contractors, with indemnity from prosecution under the NTASS Act as long as the following are adhered to: - All works are confined to the 'subject land' identified on the certificate; - All activities conducted by the Contractor are covered in the 'Purpose of Use' on the certificate; - All conditions on the certificate are adhered to; and - All contractors, employees and sub-contractors are aware of the conditions of the certificate. > **Hold Point** - Should any item be encountered which is suspected to be a relic of heritage value or any relic, artefact or material suspected of being of Aboriginal origin, all construction work that might affect the item will cease and the item protected from damage and disturbance. The Superintendent will be notified immediately. > No further works in the vicinity are to recommence until the DIPL Superintendent has provided further advice to do so. There may be a requirement for the Heritage Branch (Department of Tourism and Culture), Land Council or AAPA to investigate the findings. > All personnel working on site will receive training regarding their responsibilities related to cultural heritage and will be made aware of any sites or areas which must be avoided. > Sites or areas which must be avoided or protected during works must be identified on a site map. The map must be made available to all relevant personnel during the works. > The protection of sites may require the installation of temporary protection fencing and maintenance of the fencing.
Performance Indicator(s)	> No adverse impact to cultural heritage as part of the project; > No access or interference with known cultural heritage sites.
Monitoring	> Site supervisor monitoring access and works areas; > Daily site walkovers;

Management Strategy	Details
	> Monitoring of material removed during excavation for heritage artefacts.
Reporting	> Weekly reporting of construction activities and site use, > Immediate reporting of all cultural heritage breaches or encounter of objectives.
Corrective Action(s)	> Breach of restricted areas to result in immediate stop work, report on incident and change of procedure to avoid further breach. > Stop and reassess earthworks plan if heritage object(s) encountered.

14.2.5 Site Control / Clearing / Stockpiling

Control of environmental risk associated with site control, clearing and stockpiling is to be as per the *Soil Conservation and Land Utilisation Act 1969* and as outlined in **Table 14-7**.

Table 14-7 Site Control / Clearing / Stockpiling Management Strategy

Management Strategy	Details
Control(s)	> **Hold Point** - Provide a copy/copies of permit(s) to clear native vegetation, for the execution of the works, from the permit authority under the Planning Act and/or the Pastoral Land Act, before commencing works. > **Witness Point** - Obtain written approval from the Superintendent for the establishment and use of any detours, turnarounds or equipment lay down areas. Use existing cleared areas where possible. > Do not form any new tracks, alter any existing tracks, erect any camps, remove any trees or shrubs, cut any fences or water, sewer, power or telecommunications lines or perform other activities not specified or indicated on the drawings or otherwise required under the Contract without the prior written approval of the DIPL Superintendent. > All works are to be staged appropriately to minimise potential risks and impacts to the environment. Staging of the works must be addressed in the project timeline. > Install all necessary erosion and sediment control measures to effectively manage sediment laden runoff or wind erosion from stockpile areas. > Do not place stockpiled materials inside vegetation protection areas or within 10 metres of retained trees or within the drip line of any trees. > Do not place stockpiles within 50 metres of any drains, drainage lines, creeks or other waterways. > Locate the stockpiles so that any slump of the stockpile would not affect erosion and sediment control measures or infringe upon specified minimum clearance requirements. > Top soil stockpiles are not to be more than 2 metres in height. All other stockpiles are not to be more than 3 metres in height (unless approved by the Superintendent).

Management Strategy	Details
	> Topsoil that is not contaminated by noxious weeds must be stockpiled for later spreading on batters and other disturbed areas. Other material may also be stockpiled but separated from the topsoil stockpiles. > Stockpiles in residential areas or adjacent to sensitive receivers are not to exceed 2 metres in height. > Maintain the stockpiles to prevent the growth of weeds on the stockpiles. > Long term stockpiling in the urban environment is to include protection to reduce the risk of wind (dust) and/or rain (sedimentation). > Mulch stockpiles are to be monitored for tannin leachate. In the event leachate is identified, controls will be installed to prevent run-off from site/into waterways.
Performance Indicator(s)	> All site works and clearing is as per planned and permitted; > Stockpiles maintained as specified above at all times; > No introduction of noxious weeds or weed outbreaks; > No excessive production of dust and/or associated complaints. > Temporary works areas remediated following use.
Monitoring	> Daily site walkover and inspection by Superintendent. > Stockpile surveys if required. > Daily monitoring for noxious weeds.
Reporting	> Weekly site reporting to superintendent. > Reporting of non-conformances within 24 hours. > Reporting of any weed outbreak to DIPL Environment Officer.
Corrective Action(s)	> Stockpiles rectified/re-established if not as per above. > Weed outbreaks to be controlled and removed to satisfaction of Superintendent. > Works outside of planned/approved layout to be remediated immediately to the satisfaction of the Superintendent.

14.2.6 Erosion and Sediment Control

Erosion and sediment control will be required due earthworks, excavation, clearing and stockpiling of material. Erosion and sediment controls are to be as per the *Soil Conservation and Land Utilisation Act 1969* and as outlined in **Table 14-8**.

Table 14-8 Erosion and Sediment Control Management Strategy

Management Strategy	Details
Control(s)	> As per Section 6 of the Standard Specification for Environmental Management, an Erosion and Sediment Control Plan (ESCP) will be prepared by the contractor. Temporary erosion and sediment control measures will be kept on site at all times, for onshore construction,

Management Strategy	Details
	transport and stockpiling activities as well as during rock placement during the construction of the breakwaters and causeway. > It is the responsibility of the awarded contractor to monitor local weather and determine the requirement to install temporary controls on site, adhering to the following: - Erosion and sediment control measures will not be removed until disturbed areas have been stabilised; and - Disturbed areas will be stabilised progressively with vegetation during construction, where necessary, and stabilisation will be undertaken after works are complete and prior to demobilisation from site.
Performance Indicator(s)	> No significant erosion of stockpiles and works areas.
Monitoring	> Daily site walkover and inspection of stockpiles/batters and erosion controls.
Reporting	> Weekly site reporting to superintendent including progressive rehabilitation. > Reporting of any erosion events to Superintendent within 24 hours.
Corrective Action(s)	> Adjustment of stockpile/works areas or installation of (additional) erosion control.

14.2.7 Weed Management

There is expected to be limited or no topsoil imported for the project. The focus of management will, therefore, be on ensuring weeds are not imported due to machinery. Weed management is to be as per the *Weeds Management Act 2001* and as outlined in **Table 14-9**.

Table 14-9 Weed Management Strategy

Management Strategy	Details
Control(s)	Containment of weeds in, out and around construction facilities is to be managed through the following: > The reuse of weed contaminated topsoil by surface spreading is not permitted. > Topsoil that is contaminated with weed seeds will be quarantined with visible barriers and a notice, then treated appropriately. Alternatively, it will be buried under 300mm depth of clean, weed seed free fill. > The main methods to ensure that weeds are not spread are: - Clean machines before moving between sites; - Don't use or move materials contaminated with weed seeds; and - Avoid travelling through weeds that are seeding. > Collection and disposal of the removed earth and organic material will be conducted in a method that will ensure that it does not infest any river, stream, wetland or property.

Management Strategy	Details
Performance Indicator(s)	> No new weed species compared to those in adjacent areas. > The cover and density of weed species does not exceed that of suitable analogue sites.
Monitoring	> Daily site walkover and inspection for weeds. > Monitoring of equipment for correct washdown prior to arrival on site.
Reporting	> Weekly site reporting to superintendent identifying any imported plant and equipment or topsoil, with suitable washdown and inspection. > Reporting of any weed outbreaks to DIPL Superintendent within 24 hours.
Corrective Action(s)	> Removal of equipment if not suitably washed down; > Containment and removal of weed outbreaks.

14.2.8 Water Quality Management

Water quality management in the marine environment is outlined in detail in the project's Draft DSDMP (Cardno, 2022a). There are no surface water features within the site area. Rainfall and water applied at the site is anticipated to runoff to the ocean or infiltrate the ground. **Table 14-10** outlines management of water quality associated with construction activities on land, which must also adhere to the *Water Act 1992*.

Table 14-10 Water Quality Management Strategy

Management Strategy	Details
Control(s)	> Comply with all relevant legislative requirements and requirements of local water authorities and all other relevant laws and by-laws in force in the Northern Territory. > Provide controls, including soil erosion and sediment controls, to ensure that all water leaving the site complies with any water quality criteria. (This includes streams/waterways, bores, hydrants and stand pipes). > Water quality of the downstream environment is to remain as close as possible in quality as those upstream environments above the designated works area. > In the urban environment measures are to be implemented to prevent contaminated water leaving the worksite and entering stormwater infrastructure. > Temporary hydraulic structures such as open channels, drainage lines, batter chutes, release points into streams, and vehicle crossings, are to be designed to carry flows and remain stable, without causing erosion damage, in at least the 5-year Average Recurrence Interval (ARI) event of critical duration. > Flow in channels and drainage lines must be managed to non-erosive velocities, or channels lined with suitable protective material as necessary to prevent scouring. > Works in waterways and stormwater drainage lines are to be timed to minimise the potential for exposure to rain or flood events, have minimal disruption with disturbed areas and be rehabilitated within 10 days following completion of works in these areas.

Management Strategy	Details
	> Table drains are to be top-dressed with stripped topsoil from the project to promote the re-establishment of grasses along batters. > Conduct all dewatering activities in a manner that does not pollute the environment. > Water quality is to be adequately and continuously protected through all phases of development/construction of the project. Water discharged from the site is to be of a standard to ensure no detrimental impacts on water quality and the environment occur during the construction phase. An increase in suspended solids within surface waters discharged from a work site is not to exceed a 10% increase from upstream to downstream of the site.
Performance Indicator(s)	> Runoff and water infiltrating ground is free of contamination. > Water imported to site is of suitable quality and not contaminated.
Monitoring	> Monitoring of erosion and waste/pollution management to prevent impact to water quality passing through site. > Daily site walk-over and inspection of potential contaminants to water quality – stockpiles, stored chemicals, machinery etc. > Monitoring of weather for potential rainfall/runoff events and subsequent preparation of site.
Reporting	> Weekly site reporting to superintendent identifying any overland water quality issues or potential contaminants, locations of extraction for imported water. > Reporting to the Superintendent of any water quality issues on site within 24 hours. > Daily reporting of water quality parameters if monitoring required.
Corrective Action(s)	> Bunding/diversion to prevent flow to the ocean or overland if water is contaminated. > Increase erosion control to prevent physical water quality issues (turbidity). > Requirement to test water quality (physio-chemical parameters) if poor water quality is suspected (imported or runoff). > Cease bringing poor quality water to site and implement testing of extracted water.

14.2.9 Vegetation Management

The project is anticipated to permanently clear land for the installation of new facilities (the majority for the new carpark). Portions of the site will also be cleared for temporary works areas, laydown/stockpile areas, access routes and site buildings. **Table 14-11** outlines the management of vegetation during construction activities. Vegetation management must also comply with the *Territory Parks and Wildlife Conservation Act 1976*.

Table 14-11 Vegetation Management Strategy

Management Strategy	Details
Control(s)	> Do not destroy, remove or clear vegetation to an extent greater than is necessary for the execution of works and/or identified in the design drawings.

Management Strategy	Details
	> Minimise environmental risks by following vegetation management strategies such as: - Excluding access to significant vegetation areas; - Selecting appropriately sized clearing machinery and equipment; - Minimising worksite area; - Protecting vegetation driplines; and - Locating ancillary activities (e.g. stockpile sites, parking locations, vehicle hardstands) within existing disturbed areas. > Where trees are to remain on site within the construction zone, AS4970-2009 Protection of Trees on Development Sites is to be applied. > Should a threatened species be identified onsite, stop works in the immediate area, notify the DIPL Superintendent, and install a temporary protective barrier to protect the species. > Prior to clearing any area, it is to be demarcated with fencing, flagging tape, spray paint or other method approved by the DIPL Superintendent. > Ensure the demolition indicators (tapes, spray paint or other) do not go outside of the clearing limits shown on the drawings or the clearing limits approved in writing by the DIPL Superintendent. Ensure that all site personnel observe the limits of clearing and are made aware of the importance of any vegetation of significant value. > Should works or disturbance be proposed in areas outside the previously approved works boundaries, permission must be obtained in writing from the DIPL Superintendent. > Clearing will be staged so that land disturbance is confined to minimum areas of manageable size, thereby limiting the extent and duration of exposure. Control measures will be applied progressively as each stage is cleared. > All areas to be cleared or used as turnaround or laydown areas will be identified on clearing plans, approved by the DIPL Superintendent, provided to the personnel undertaking the clearing works, and flagged on the ground prior to any clearing activities commencing. > Cleared vegetation can also be mulched on site and re-used on site where appropriate as ground cover or environmental control measures, if suitable. > Storage of cleared vegetation and stripped topsoil is not to impact on areas outside of that required for project works. > Clearing of native vegetation, particularly within extraction areas is to adhere to the buffer requirements to waterways referenced in the NT Land Clearing Guidelines 2019. > Any variation to the buffer distances outlined in the NT Land Clearing Guidelines will require prior written approval from the DIPL Superintendent.

Management Strategy	Details
	> Remove excess or unwanted material from the site and dispose in accordance with local authority requirements and guidelines. > Cleared areas will be rehabilitated to a point where closure objectives are met (Section 14.3).
Performance Indicator(s)	> No permanent degradation to vegetation outside extent of construction footprint. > No disturbance to vegetation outside construction zone. > Conformance with conditions of clearing permit, EPA approval and Development Consent. > No threatened flora species removed without prior approval of the superintendent. > Native perennial seedlings are recorded on the rehabilitation area and are representative of species found in suitable analogue sites.
Monitoring	> Daily site walkover to inspect cleared or future cleared areas.
Reporting	> Reporting of any land clearing outside if the extent indicated in the design drawings to Superintendent within 24 hours. > Reporting of any threatened species to DIPL Superintendent and Environment Officer as soon as practicable.
Corrective Action(s)	> All excess land clearing is to be rehabilitated (refer to **Section 14.3**). > Improvement of demolition indicators.

14.2.10 Fauna Management

Listed fauna species predicted to occur within the 10 km locality are predominantly birds, mainly species associated with aquatic environments. Some threatened species have been recorded in the area or have the potential to occur there. **Table 14-12** outlines the management of fauna encountered during construction activities. Fauna management must also comply with the *Territory Parks and Wildlife Conservation Act 1976*.

Table 14-12 Fauna Management Strategy

Management Strategy	Details
Control(s)	> All native wildlife must be protected wherever practicable. > All trees to be removed are to be inspected to establish whether nesting native fauna are present. If present, disturbance will only proceed after approval from the DIPL Superintendent and Environment Officer; > Fauna spotters/handlers are required for the clearing of mature trees that have a high risk of nesting or roosting opportunities for wildlife. > Should a threatened species be identified onsite, stop works in the immediate area, notify the DIPL Superintendent, and install temporary protective barriers to protect the species; and > Should any species require relocation/handling or an injured species is found on site, a certified wildlife carer is to be contacted immediately (e.g. Wildcare NT).
Performance Indicator(s)	> Nesting native fauna identified before disturbance. No felled trees are found to have housed native nesting fauna;

Management Strategy	Details
	> Minimal impact to native fauna species; and > No injury or death to threatened fauna species.
Monitoring	> Inspection of trees prior to and after felling for the presence of fauna; and > Daily site walkover to identify fauna on site.
Reporting	> Reporting of any identified native species to Superintendent; and > Reporting of any injury or death of fauna to Superintendent.
Corrective Action(s)	> Removal of native nesting fauna from area to be cleared by a certified wildlife carer; and > Injured fauna to be attended to by a certified wildlife carer.

14.2.11 Pest Animal Management

Pest animal management is to be as per *Territory Parks and Wildlife Conservation Act 1976* and as outlined in **Table 14-13**.

Table 14-13 Pest Animal Management Strategy

Management Strategy	Details
Control(s)	> Ensure that all necessary measures are undertaken to prevent and minimise the risk of the introduction and spread of pest animals. No domestic pets, including dogs, are to be brought to the construction site by construction personnel without written approval from the DIPL Superintendent. If approved, pets must be under control and safely secured at all times. > Provide evidence that pets will be under control and safely secured at all times. > All necessary measures are to be implemented to prevent the establishment of suitable environments for mosquito breeding habitat. Where works are undertaken in areas known for biting insects, personal protective measures are to be made available to workers and visitors. > All waste bins will have lids to prevent the attraction of pests and vermin. Where skips are used for food waste, covers are to be utilised to reduce the risk of attracting pests.
Performance Indicator(s)	> No increase in pests due to site works. > No ponded water. > Mosquito numbers managed. > No unapproved pets on site.
Monitoring	> Regular site walkthrough to identify pest species, ponded water, open water storages, unapproved domestic animals, inappropriate waste storage.

Reporting	> Incidence of pest species on site reported to the Superintendent and Environmental Officer within 24 hours of detection.
Corrective Action(s)	> Ponded water removed and location mended to prevent future ponding. > Open water storages covered or drained if unnecessary. > Pests and unapproved animals removed.

14.2.12 Fire Management

Fire management is to be as per the *Fire and Emergency Act 1996*, *Bushfires Management Act 2016* and as outlined in **Table 14-14**.

Table 14-14 Fire Management Strategy

Management Strategy	Details
Control(s)	The risk of fire, either ignited within construction facilities, or wildfire on the Cox Peninsula is to be managed through the following: > Lighting of fires for clearing of vegetation or disposal of rubbish is not permitted under any circumstances; > Where fires are accidentally started, extinguish the fires immediately if appropriate and safe to do so; > The provision of containers or sand buckets are required around workers compounds/camp sites and where practical in the worksite for the disposal of cigarette butts; > No hot works are to be undertaken on days of total fire ban or when high winds may result in sparks spreading to adjacent vegetation; > Fire extinguishers are to be located near chemical/dangerous goods stores, flammable materials and appropriately around the site; > Fire extinguishers and fire hose reels are to be tested and tagged to show they are in good working condition; > Emergency response plans are to be developed in case of fire; and > Mulch stockpiles are to be monitored on a daily basis to ensure that they have not spontaneously combusted. In the event that a much stockpile catches alight, it will be extinguished immediately.
Performance Indicator(s)	> No uncontrolled fires within construction site. > No build-up of flammable material near hot work areas. > Permits and approvals sought as required. > Emergency response plan in place.
Monitoring	> Daily inspection of site for build-up of flammable materials and/or near misses.

Management Strategy	Details
Reporting	> Non-compliance and incident reporting will be reported to the superintendent.
Corrective Action(s)	> Excess flammable material removed from site; and > Update to emergency response plan.

14.2.13 Air Quality

Air quality management is to be as per the *National Environment Protection (Ambient Air Quality) Measure 1998*, the *Fuel Quality Standards Act 2000* (National) and as outlined in **Table 14-15**.

Table 14-15 Air Quality Management Strategy

Management Strategy	Details
Control(s)	Construction facilities are to be designed and operated to minimise the emission of smoke, dust, pesticides and other substances into the atmosphere. Facilities should also comply with the requirements of the WMPC Act and any conditions of licences, notifications, approvals or permits in relation to maximum air pollutant levels. Construction methods that will keep the air pollution to a minimum shall be employed. Apply appropriate measures to ensure that airborne pollutants from all activities do not cause undue disruption or inconvenience in the vicinity of the Site including but not limited to, the following: > Spraying of earthwork formations and roads with water or other suitable liquids approved by the Superintendent; > Removal of mud from the wheels and bodies of haulage equipment before it enters public roads or other sealed pavements; > Quick removal of mud spilt or deposited by the transport of materials on to public roads or other sealed pavements; > Limit vehicle speeds on unsealed roads/surfaces to control the generation of dust by vehicles; > Establishment of suitable cover crop or provision of other covering over topsoil stockpiles; > Erection of dust screens around and/or spraying of stockpiles with suitable stabilising agents; > Stopping dust generating activities which cannot be adequately controlled by water or other means; > Transportation of materials which are suitably covered and loaded in a manner that will prevent dropping of materials;

Management Strategy	Details
	> Maintaining dust control equipment so that this equipment is available when required, including periods of dust generating activities or high wind speed; > Maintaining exhaust systems of construction plant, vehicles and machinery in accordance with manufacturer's specifications and undertaking periodic visual checks of exhaust systems' emissions; > Treating topsoil stripped areas with no scheduled activities within two weeks to prevent dust generation; and > Where monitoring is required, the monitoring must comply with the NT EPA air quality guidelines.
Performance Indicator(s)	> Visual observance of dust plume. > Visual observance of defective exhausts. > Complaints by public. > Regular watering of access roads on an 'as needs' basis.
Monitoring	> Daily site walkthrough to identify dust plumes, potential sources of dust and condition of access roads. > Pre-work inspection daily to check exhaust from onsite plant.
Reporting	> Visible dust plumes and complaints by the public are to be reported to the superintendent within 24 hours. > Faulty onsite plant exhausts are to be reported to the superintendent within 24 hours.
Corrective Action(s)	> Plant to remain unused until visible exhaust improved to the satisfaction of the superintendent. > Increased watering of access roads to reduce mobilised dust. > Stockpile management to reduce dust production.

14.2.14 Noise and Vibration Control

Noise and vibration management is to be as per *AS 2436* and as outlined in **Table 14-16**.

Table 14-16 Noise and Vibration Management Strategy

Management Strategy	Details
Control(s)	The standard working hours will be 7am to 7pm Monday to Saturday and between 9am to 1pm on Sundays or public holidays, operating within the requirements of the NT EPA Noise Guidelines for Development Sites in the Northern Territory and the WMPC Act, or where operation outside of these guidelines is required obtain approval from the DIPL Superintendent to do. Where applicable the following measures will be applied to minimise the impact of noise: > Substitution by an alternative process; > Restricting times when noisy work is carried out;

Management Strategy	Details
	> Placement of work compounds, parking areas, equipment and material stockpile sites away from noise-sensitive locations; > Where noise barriers/walls are to be constructed, programming this as early as possible to reduce noise impacts from other construction work on neighbouring residents; > Screening or enclosures; and > Consultation with affected residents.
Performance Indicator(s)	> No unexpected and heightened noise from machinery. > Evidence of consultation and planning for atypical noise events. > No complaints by public.
Monitoring	> Regular site walkthrough to identify sources of noise and/or unnecessary activities. > Monitoring of work hours.
Reporting	> Complaints by the public are to be reported to the Superintendent within 24 hours. > Faulty machinery causing increase noise or vibrations to be reported to the Superintendent within 24 hours.
Corrective Action(s)	> Replacement or repair of faulty equipment. > Construction of noise barriers or restricting activities to certain time of the day.

14.2.15 Contamination Management

Contamination management should comply with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* and *Waste Management and Pollution Control Act 1998* in relation to disturbance or treatment of potentially contaminated land and through to procedures outlined in **Table 14-17**.

Table 14-17 Contamination Management Strategy

Management Strategy	Details
Control(s)	> Immediately implement any control measures needed to divert surface runoff away from contaminated land and to capture and manage any surface runoff contaminated by exposure to contaminated land. > Transportation of chemicals and dangerous goods is to be undertaken in accordance with relevant NT and National legislation, codes and standards. > Plan and execute all works to minimise the possibility of pollution of the site and adjoining areas from chemicals, dangerous goods and other potential contaminants. > Use, store and handle chemicals and dangerous goods in accordance with all relevant legislation, manufacturer's instructions and the relevant Safety Data Sheets (SDS). Employ transporting, handling, storage and

Management Strategy	Details
	application methods that will prevent chemical, fuel and lubricant spillage on the site and adjoining areas. > Contain and maintain on site an up to date SDS Register and copy of all SDSs for those materials stored on site. > Do not pollute or permit pollution of land or waterways by a chemical, fuel or lubricant, or any waste material or imported fill. > Storage of chemicals and fuels is to meet requirements under AS1940-2004 - The Storage and Handling of Flammable and Combustible Liquids. As a minimum the capacity of the bunded area (spillage containment compound) shall be at least 100% of the volume of the largest package plus 25% of the storage capacity up to 10,000 Litres (L), together with 10% of the storage capacity between 10,000 L and 100,000 L, and 5% above 100,000 L. > The bunded storage area shall be sufficiently impervious to retain spillage and to enable recovery of any such spillage. > Do not locate storage areas within 50 m of natural or built drainage lines, flood prone areas, or on slopes steeper than 1:10. > Do not leave refuelling operations unattended. > Do not refuel or maintain plant and equipment, mix cutting oil with bitumen, or carry out any other activity which may result in the spillage of a chemical, fuel or lubricant on any location with direct drainage to a waterway or environmentally sensitive areas without appropriate temporary bunding. > Vehicles and machinery are to be maintained to manufactures specifications to reduce the risk of fuel, oil or hydraulic fluid spills into the surrounding environment. > Where possible, workshops are to have impermeable floors to prevent hydrocarbon spills into the soils. If not, contaminated soils from the workshop area are to be disposed of in accordance with the WMPC Act. > Before discharging any water from bunded areas, verify that the water complies with any applicable legislation or water quality criteria nominated by the NT EPA and/or DENR. Arrange appropriate treatment if the water quality is not suitable for discharge. > Spill clean-up equipment and materials, appropriate for the type and quantities of chemicals used on site, must be kept on site at all times during the works and in a readily accessible location. > The equipment and materials for spill clean-up and containment must be maintained and replenished as needed. > All site personnel must be trained in the use of spill clean-up equipment, and containment of materials, including appropriate storage of chemicals if materials must be on site whilst any works are conducted. All site personnel must be aware of the location of spill kits on sites. > Clean up all chemical spills immediately. This may require the excavation of contaminated soil and appropriate remediation or disposal at waste disposal facility. If spills result in an environmental

Management Strategy	Details
	incident, ensure that the incident is reported in accordance with reporting procedures and legislative requirements. > Do not dispose of liquid paint materials or other hazardous materials by flushing down stormwater system or natural waterway. > Report all chemical spills to the DIPL Superintendent. Where appropriate, also report spills to the NT Pollution Hotline, phone 1800 064 567.
Performance Indicator(s)	> No recorded chemical spills or waste released to the environment. > All contaminated sites encountered managed appropriately. > Chemical storage locations deemed appropriate. > Any spills confined and cleaned up immediately.
Monitoring	> Daily site walkthrough to identify inappropriate storage of chemicals. > Audits of transport and handling following all relevant SDS.
Reporting	> Report all chemical spills to the Superintendent. Where appropriate, also report spills to the NT Pollution Hotline, phone 1800 064 567. > Suspected disturbance of contaminated site reported immediately to Superintendent and related works paused.
Corrective Action(s)	> Relocation of chemical storages. > Removal of unnecessary chemical storages. > Management and remediation (or avoidance) of contaminated site to satisfaction of Superintendent before recommencing related works.

14.2.16 Waste Management

Construction activities are required to comply with the requirements of the *Waste Management and Pollution Control Act 1998* and the procedures outlined in **Table 14-18**.

Table 14-18 Waste Management Strategy

Management Strategy	Details
Control(s)	> Ensure that all effluent from proposed chemical toilets is discharged into an approved facility or, if permitted by the controlling authority, the local sewerage system. Effluent disposal direct to ground or water is NOT permitted. > Remove from the site and dispose of all waste materials, including green waste, food scraps and other putrescible wastes, construction waste, chemicals and effluent in an appropriate manner, in approved legal waste disposal sites or facilities. > Recycle waste materials where appropriate. > Maintain a Waste Management Register for the duration of the Contract, to record the types, amounts and locations of waste reused, recycled,

Management Strategy	Details
	stockpiled and / or disposed of. The Waste Management Register must include the following details: - Type of waste and its classification (according to the WMPC Act and DENR Waste Classification Guidelines) (Schedule 2 of the Waste Management and Pollution Control Regulations); - Tonnes of waste; - How and where the waste was reused, recycled, stockpiled or disposed; - Date when the waste was reused, recycled, stockpiled or disposed; - Name of the transporter used (Person or Business name); and - Be able to produce receipt of commercial disposal if requested. > Implement measures to reduce, re-use and recycle construction waste products/materials including soil, road pavement materials, concrete, oils and vegetation. > Implement measures to recycle waste such as cardboard, plastic and glass bottles and aluminium cans.
Performance Indicator(s)	> Cleanliness of site during construction. > Cleanliness of site post construction. > No waste/litter reported off-site.
Monitoring	> Correct record keeping of waste register. > Housekeeping checks to assess the effectiveness of waste disposal. > Daily site walk through to assess general cleanliness, including post construction. > Regular walk through of surrounds of site to assess litter levels.
Reporting	> Non-compliance and incident reporting to the Superintendent.
Corrective Action(s)	> Worker refresher on waste management. > Review/adjustment of waste management procedures. > Site clean-up.

14.2.17 Light Management

The objective of artificial lighting will be to adequately and safely illuminate the work area during the dredging phase of the Proposal, with all lighting implemented following this activity (associated with the current and new infrastructure) will be designed to adhere to the best practice lighting design principles to reduce sky glow and to minimise the effects of artificial light on wildlife. Construction activities will comply with the requirements of the *National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds 2020* (Commonwealth of Australia, 2020) and the procedures outlined in **Table 14-19**.

Table 14-19 Light Management Strategy

Management Strategy	Details
Control(s)	> **Start with natural darkness and only add light for specific purposes:** Artificial light should only be implemented for specific purposes, within a specified location and for the specified duration of

Management Strategy	Details
	human use. An upper limit on the amount (duration and intensity) of artificial light should be considered. Consideration will also be given to designating 'dark places', where outdoor artificial lights are prohibited (in a regional planning context). > **Use adaptive light controls to manage light timing, intensity and colour:** Current lighting technologies will be considered/implemented to adequately control the timing (instant on-off, timers), light intensity (dimming, motion sensors, directivity of light, flashing rate), light colour and the remote management of artificial lighting to minimise unnecessary light output and energy consumption. > **Light only the object or area intended:** Light spill (i.e. light that spills above the horizontal plane to contribute to sky glow and light trespass) can be detrimental to wildlife, with all light fittings located (close to ground), directed (downwards, at work area/object) or shielded (to reduced sky glow) in such a manner to avoid lighting anything but the target object or area. Light spill from internal light sources should also be considered under this principle (block out blinds, shutters etc.) > **Use the lowest intensity lighting appropriate for the task:** Use the minimum number and intensity of lights required (to be assessed during the early design stages) to provide safe and secure illumination for the area at the time required to meet the lighting objective/s. Lighting design models should incorporate wildlife considerations, with motion sensor lighting and low glare alternatives to be considered during the design process in relation to light intensity. > **Use non-reflective, dark-coloured surfaces:** Reflected light can contribute to sky glow, especially when reflected off polished, shiny, or pale coloured surfaces. The colour of paint required on any new and existing infrastructure will take this into account and be stipulated in the Artificial Light Management Plan (to be provided by the contractor). > **Use lights with reduced or filtered blue, violet and ultra-violet wavelengths:** Short wavelength light (blue) scatters more readily and contributes more to sky glow than longer wavelength light. Wildlife are typically sensitive to short wavelength light, with lights of little or no wavelength (blue/violet, 400 – 500 nm) preferable for artificial outdoor lights, however some species are sensitive to longer wavelength light, with consideration to be given on a case by case basis. If colour rendition is required for human use, other mitigation methods (control of light spill, use of head torches, timers/motion sensors) will need to be considered/implemented.
Performance Indicator(s)	> Wildlife is not disrupted within, nor displaced from, important habitat; and > Wildlife can undertake critical behaviours such as foraging, reproduction and dispersal.
Monitoring	> Confirm compliance with the artificial lighting controls > Check as-built compliance with engineering design > Conduct a visual inspection of the facility lighting from the wildlife habitat
Reporting	> Non-compliance and incident reporting to the DPIL Superintendent.

Management Strategy	Details
Corrective Action(s)	> Adjust lighting to comply with artificial lighting controls / engineering design

15 Rehabilitation

Management of rehabilitation of cleared land is to be as per the *Soil Conservation and Land Utilisation Act 1969*, *Weeds Management Act 2001* and as outlined in **Table 14-20**.

Table 15-1 Rehabilitation Management Strategy

Management Strategy	Details
Control(s)	> All areas which have been temporary cleared, used as turnaround or laydown areas are to be rehabilitated progressively, to reduce the area of exposed soil during construction works. > The project footprint consists largely of previously cleared land, reseeding with natives is to take place to restore and enhance vegetation in the area. Where native vegetation does exist, cleared vegetation will be spread prior to demobilisation to assist the re-colonisation of flora across the site. > Previously stripped and stockpiled material including topsoil and overburden will be pushed back over the excavation, detour or access track. The stockpiled topsoil is spread over the disturbed areas to encourage regrowth from the soils seed store. The surface of the topsoil will be scarified which will further enhance the ability of the material to trap mobile seeds, dust and moisture.
Performance Indicator(s)	> No new weed species compared to those in adjacent areas. > Native perennial seedlings are recorded on the rehabilitation area and are representative of species found in suitable analogue sites. > The cover and density of weed species does not exceed that of suitable analogue sites. > No signs of erosion or change in drainage patterns for disturbed and rehabilitated land. > Rehabilitated area contains sufficient vegetation coverage to mitigate erosion of the final surface.
Monitoring	> 2 months after the first rainfall event, and annually until criteria is met.
Reporting	> Non-compliance reported to DIPL Superintendent.
Corrective Action(s)	> Minor earthworks / drainage lines re-established. > Reseeding to take place where regrowth is not matching analogue sites.

15.2 Success criteria and closure objectives

Success criteria, also termed completion, closure or performance criteria, can be defined as agreed standards or levels of performance that indicate the success of rehabilitation and enable an operator to

determine when the liability for an area will cease (Young et al., 2019). Criteria should be defined by objective, achievable and measurable outcomes so that the effectiveness of the rehabilitation and revegetation activities can be assessed over time and reported on for the duration required by environmental approval and DIPL internal rehabilitation standards and monitoring methods, as agreed with the contractor.

It is recommended that progress of the rehabilitated areas towards meeting the rehabilitation objectives should initially be assessed against the proposed criteria displayed in **Table 14-21**. Rehabilitation objectives relating to vegetation establishment, soil, landform stability, weeds and dust levels are each proposed to be supported with specific criteria and standards with defined monitoring approaches as further developed by the contractor to support these outcomes and the requirements in the DIPL Environmental Standard specification relating to rehabilitation. The criteria will focus on early success indicators such as initial establishment and presence of appropriate species. These criteria may be updated in the CEMP to ensure they meet the rehabilitation objectives.

For final closure objective, a suitable approach may be to devise quantitative standards for vegetation and soil parameters as a percentage of the average (e.g. 60-70%) from the most recent current monitoring of analogues, which should be representative of the *Terminalia* spp. open woodland providing for a mixed sparse shrubland understory and *Cenchrus* spp. mixed low tussock grassland communities found onsite. This approach is proposed to maintain consistency with the Draft CEMP and may continue to be refined once the contractor has collected sufficient data over successive monitoring periods.

Table 14-21 outlines explicit success criteria for the key environmental issues raised in association with rehabilitation and closure of disturbances.

Table 14-21: Proposed Success Criteria

Aspect	Objective	Success Criteria	Monitoring Methodology	Timing
Landform	The rehabilitated area is safe and stable	• Rehabilitated area ensures that sufficient vegetation coverage to mitigate erosion of the final surface. • The final surface develops resistance to erosive forces.	• Survey by Contractor Environmental representative of final rehabilitated area for compliance against design specifications and levels. • Erosion monitoring transect where appropriate.	• Survey of rehabilitated area to be undertaken at completion of rehabilitation works. • Erosion assessment conducted annually for 2 years post construction.
Dust	Dust suppression is utilised to prevent negative off-site impacts	• Vegetation coverage or constructed dust mounds capable of trapping dust and sand (if required). • Dust from the development is not affecting adjacent vegetation or off-site areas.	• Visual assessment for presence of dust on surrounding vegetation and of dust lift-off in high wind conditions – Vegetation Assessment (Section 15.2.3). • Photographic monitoring undertaken to determine whether any mounding is effective.	• Annually for 2 years post construction
Soil / Vegetation	Soils and vegetation attributes in rehabilitated areas will have values indicative of target ecosystems	• Native perennial seedlings are recorded on the rehabilitation area and are representative of species found in suitable analogue sites.	• Vegetation assessment (Section 15.2.3) to record species density and richness.	• Annually for 2 years post construction
	Weeds (introduced species) do not dominate rehabilitated areas	• No new weed species compared to those in adjacent areas. • The cover and density of weed species does not exceed that of suitable analogue sites.	• Vegetation assessment (Section 15.2.3) to record the density and cover of weed species.	• Initial visual assessment for weed seedling emergence and establishment 2 months after the first rainfall event, and full vegetation assessment annually for 2 years post construction.

15.2.1 Measurement Approaches

The contractor will monitor the rehabilitation process to track the trajectory of the rehabilitated areas and identify areas where mitigation measures may be required. Monitoring data from the rehabilitated areas and analogue sites will inform further development of the success criteria. In addition, visual assessments will be undertaken and documented in a suitable inspection sheet.

15.2.2 Photographic Monitoring

Once the temporary works area has been rehabilitated, photographic monitoring will take place to assess soil loss from the surface and dust deposition in relation to surface features such as constructed mounds, or vegetation across the area as a whole.

15.2.3 Rehabilitation Monitoring

Monitoring of the rehabilitated areas after construction will be conducted along a single transect (50 m) positioned where possible on the middle of the site, aligned in the direction of the prevailing wind. Data will be collected using the following methods:

- Vegetation quadrats (2 x 2 m) at 5 m intervals along the transect (10 per 50 m length of transect) for assessment of vegetation parameters including cover of native perennial, annual and introduced species, native perennial plant density and species richness;
- Erosion (rill/gully) assessment where relevant.

We note that although vegetation cover data will be collected, it is not a parameter that is proposed for the success criteria, due to early stages of germination and initial focus on early success indicators of density and species richness instead.

Comparison of this data against that from analogue communities will be undertaken for success criteria. Analogues should represent a suitable land system and vegetation community. Due to the uniform nature of the surrounding *Terminalia* spp. open woodland providing for a mixed sparse shrubland understory and *Cenchrus* spp. mixed low tussock grassland neighbouring plots which were surveyed pre-construction may be used as analogues.

16 References

Cardno (2022a) *Draft Dredging and Spoil Disposal Management Plan: New Marine Facilities to Service Mandorah and Cox Peninsula.* Prepared for DIPL.

Cardno (2022b) *Environmental Referral Report: New Marine Facilities to Service Mandorah and Cox Peninsula.* Prepared for DIPL.

Cardno (2022c) *Terrestrial Environment Report: New Marine Facilities to Service Mandorah and Cox Peninsula.* Prepared for DIPL.

Cardno (2022d) *Marine Environment Report: New Marine Facilities to Service Mandorah and Cox Peninsula.* Prepared for DIPL.

Cardno (2022e) *Design Report: New Marine Facilities to Service Mandorah and Cox Peninsula.* Prepared for DIPL.

DIPL (2020) *Contractor's environmental management plan template*. Available at: https://dipl.nt.gov.au/industry/technical-standards-guidelines-and-specifications/environmental-management

Young, R.E., Manero, A., Miller, B.P., Kragt, M.E., Standish, R.J., Jasper, D.A., & Boggs, G.S. (2019). A framework for developing mine-site completion criteria in Western Australia. The Western Australian Biodiversity Science Institute. Perth, Western Australia.

APPENDIX A

RISK ASSESSMENT

Table 1: Consequence categories and ratings

Score	Consequence or severity of impacts	Description
5	Severe	A Severe impact has two or more of the following characteristics: Widespread - Impact occurs at a NT, national, international or global scale High Intensity - Impact irreversibly compromises the integrity of environmental values Permanent - environmental values will not recover on human time scales
4	Major	A Major impact has two or more of the following characteristics: Regional - Impact extends to the Darwin/ Palmerston region, and/ or greater Darwin Harbour Moderate - Integrity of environmental values altered but impact can practicably be reversed Long term - Impact that is measurable post-Project
3	Moderate	A Moderate impact has two or more of the following characteristics: Localised - Impact is confined to the Site and areas directly adjacent to the Site, such as other allotments, Elizabeth River, and estuarine watercourses adjacent to the S Low - Impact alters the quality, abundance or distribution of environmental values without compromising their integrity, and can be easily and cheaply reversed Medium term - Impact that is felt up to completion of operations
2	Minor	A Minor impact has two or more of the following characteristics: Limited - Impact limited to the Site Very Low - Impact does not significantly alter the quality, distribution or abundance of environmental values Short term - Impact that is felt up to completion of construction
1	Insignificant	Insignificant No noticeable/ measurable impact to values

Table 2: Likelihood categories

Liklihood Category	Description
Almost certain	The event/ impact will occur or is expected to occur. The impact occurs regularly in association with similar projects and/ or in similar environments.
Likely	The impact will probably occur in most circumstances but there is some uncertainty about the likelihood. The impact has occurred on more than one occasion in association with similar projects and/ or in similar environments.
Possible	The impact could occur in some circumstances. The impact has occurred infrequently on similar projects and/ or in similar environments.
Unlikely	The impact is not expected to occur. The impact occurs very infrequently on similar projects and/ or in similar environments.
Rare	The impact is very unlikely to occur. The impact has not occurred on similar projects and/ or in similar environments.

Table 3: Risk level definitions and responses

Risk Level	Response
Very High	*Risk is unacceptable. Specific action plans required to reduce risk to an acceptable level. Director/ CEO level management attention required.*
High	*Risk is generally unacceptable without action. Specific action plans required to reduce risk to 'as low as is reasonably practicable' (ALARP). Senior management attention r*
Medium	*Risk is generally acceptable. Proactive action is required to reduce risk to ALARP. Requires routine monitoring and adaptive management in accordance with Environmenta Management Plan. Line management attention required.*
Low	*Risk is acceptable. Management by routine policies and procedures.*

Table 4: Risk rating matrix

Likelihood		Consequence				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Severe
5	Almost Certain	Medium	Medium	High	Very High	Very High
4	Likely	Medium	Medium	High	Very High	Very High
3	Possible	Low	Medium	Medium	High	Very High
2	Unlikely	Low	Low	Medium	Medium	High
1	Rare	Low	Low	Low	Medium	High

Table 5: Level of certainty categories

Level of Certainty	Description
High	Risk rating is based on testing, modelling or experiments. Baseline information is complete and an appropriate level of analysis has been undertaken. Proposed mitigation were recommended by technical specialists and are well developed with demonstrated efficacy. Minimal further work is required to adequately understand risk.
Medium	Risk rating is based on similar conditions being observed previously on a similar project and/ or in a similar environment. Baseline information has some gaps that are cons minor, and further work is unlikely to significantly alter the risk rating. While the efficacy of proposed mitigation measures has been demonstrated, some further work is req provide details of implementation prior to commencement of the Project.
Low	Risk rating is based on professional opinion. Limitations in baseline information require that some assumptions are made, which introduces a level of uncertainty. Effectiver proposed controls and/ or the likelihood of implementation cannot be reliably assessed at this point in time. A substantial amount of further work is required to adequately m prior to commencement of the Project.

Consequence or severity of Impacts	Score	Terrestrial Environmental Quality	Terrestrial Ecosystems	Coastal Processes	Marine Environmental Quality	Marine Ecosystems	Community and the Economy	Cultural and Heritage
Severe	5	Soil disturbance, erosion or contamination that is measurably and permanently impacting environmental values that rely on good soil quality throughout the NT	Extinction of terrestrial flora, vegetation or fauna	Permanent and widespread disturbance to the coastal processes within Darwin Harbour, such as tides and currents	Exceedance of baseline water quality that permanently alters the ecological functioning and/ or amenity of Arafura Sea	Complete loss of a benthic habitat or community type	Permanent impact that is felt by the majority of the NT population Unauthorised destruction of Aboriginal heritage item and/ or sites of world or national heritage significance	Unauthorised destruction of Aboriginal heritage item and/or sites of world or national heritage significance
Major	4	Soil disturbance, erosion or contamination that compromises regional environmental values that rely on good soil quality, and would be costly and technically challenging to remediate	Regional scale impacts on terrestrial flora, vegetation or fauna that compromise post-Project biodiversity and/ or ecological integrity	Permanent and localised disturbance to the coastal processes within Darwin Harbour, such as tides and currents	Exceedance of baseline Darwin Harbour water quality that continues for many years post-Project	Regional scale impacts on benthic habitat or community that compromise post-Project biodiversity and/ or ecological integrity	Impact that is felt by a majority of the regional population post-Project Unauthorised damage/ desecration of Aboriginal heritage item and/ or sites of regional heritage significance such that integrity is lost	Unauthorised damage / desecration of Aboriginal heritage item and/or sites of regional heritage significance such that integrity is lost
Moderate	3	Medium term soil disturbance, erosion or contamination in the vicinity of the Site that that alters soil characteristics but with no measurable impact to environmental values that rely on good soil quality, and can be remediated	Localised impact to flora, vegetation or fauna that alters the quality, abundance or distribution but with no measurable impact on biodiversity and/ or ecological integrity within months of the Project concluding	Permanent localised disturbance to the sediment transport within Darwin Harbour, temporary distrubance to tides and currents in Darwin Harbour	Localised exceedances of baseline marine water quality that occurs throughout operations but ceases within months of the Project concluding	Localised impact to benthic habitat or community that alters the quality, abundance or distribution but with no measurable impact on biodiversity and/ or ecological integrity within months of the Project concluding	Impact that is felt by a small number of people during the Project, ceasing within months of the Project concluding Unauthorised activity but with no physical impact to a heritage item, or minor physical impact such that integrity is not lost	Unauthorised acitvity but with no physical impact to a heritage item, or minor physical impact such that integrity is not lost
Minor	2	Short term soil disturbance, erosion or contamination in the vicinity of the Site that is reversible without significant remedial works	Impacts on flora, vegetation or fauna that do not measurably alter environmental values outside of the Site after construction concluding	Short term soil disturbance of coastal	Exceedances of baseline marine water quality at the Site ceasing within months of construction concluding	Impacts on benthic habitat or community that do not measurably alter environmental values outside of the Site after construction concluding	Impact felt by a small number of people at the Site during construction Unauthorised activity but with no physical impact to a heritage item	Unauthorised activity but with no physical impact to a heritage item
Insignificant	1	No measurable soil disturbance, erosion or contamination	No measurable impact on terrestrial flora, vegetation or fauna	No measurable impact on coastal processes	No significant change to baseline marine water quality	No measurable impact on benthic habitat or communities	No noticeable impact to stakeholder or community values No impact to Aboriginal Sacred or other heritage sites	No impact to Aboriginal sacred or other heritage sites

Theme	Environmental Aspect	Risk Pathway(s)	Potential Impacts	Likelihood	Potential Consequence	Inherent Risk Rating	Risk Management/Mitigation	Residual Likelihood	Residual Consequence	Residual Risk Rating	Level of Certainty	Project Phase
LAND	*Environmental Factor: Landforms*											
	Construction of landforms	Breakwaters (and to a lesser degree, causeway and boat ramp) are large structures that could be considered as new landforms	Significant change to the existing nearshore morphology at the site	Almost Certain (5)	Moderate (3)	**Very High**	> Design to minimise size of breakwaters, causeway and boat ramp limited to maintaining functionality and safety.	Possible (3)	Insignificant (1)	**Low**	Medium	Operations
	Changes to local shoreline	Construction of breakwaters disrupts the natural longshore drift of sediment down the adjacent coastline	> Disruption of net south migration of sediment > Increase in beach width north of the facilities, smothering the existing benthic communities > Erosion immediately south of the facilities due to blocking of usual sediment feed	Likely (4)	Moderate (3)	**High**	> Design to maximise natural bypassing mechanism > Understanding (investigation and modelling) of expected sedimentation volumes and locations > Allowance for ongoing sand bypassing that transfers sand past the marine facilities maintaining the net annual sediment transfer volumes	Possible (3)	Insignificant (1)	**Low**	Medium	Operations
	Environmental Factor: Terrestrial Environmental Quality											
	Exposure of contaminants during earthworks	> Exposure of potential Acid Sulfate Soils (ASS) > Exposure of potential metals or hydrocarbons > Exposure of asbestos containing soil	> Negative impacts to soil quality, stability and fertility > Acidic runoff discharging into Darwin Harbour > Invasion of acid-tolerant water plants and plankton species	Unlikely (2)	Major (4)	**Medium**	> Stop works if ASS is encountered, implement ASS management measures before works continue > Stop works if suspected asbestos material is encountered, implement asbestos removal management measures before works continue > Limit the area of exposed earth and period of exposure.	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Contaminants released during construction activities	Spills/leaks of petrol, oils, lubricants, hazardous materials, paints, thinners and litter	Adverse impact on soil quality within and adjacent to project footprint	Possible (3)	Moderate (3)	**Medium**	Contractor to develop a Hazardous Material Management Procedure including but not limited to the following: > Ensure stockpiles of bulk materials are well contained separated from exposed soils; > Training for personnel in implementation of safe work practices to minimise risks and impacts of spillage of fuels, chemicals and other contaminants; > Record and report all POL, chemical and hazardous substance spills; and > Ensure personnel have access to spill kits that contain an absorbent material and contaminated disposal sites.	Unlikely (2)	Minor (2)	**Low**	High	Construction
	Clearing areas of existing vegetation	Removal of vegetation and topsoil leaves area susceptible to erosion	> Loss of topsoil during overland flows > Eroded topsoil causing sedimentation in Darwin Harbour	Possible (3)	Minor (2)	**Medium**	> All clearing to be undertaken in accordance with Land Clearing Guidelines (DENR, 2019) > Cleared land outside of the direct footprint is to be rehabilitated using appropriate soils and vegetation	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Contaminants released during operations	> Chemical toilet leak to environment > Fly tipping	> Hazardous substances contaminating soils	Possible (3)	Moderate (3)	**Medium**	> Regular maintenance to be carried out on toilets > Adequate lighting and cctv to prevent illegal disposal	Unlikely (2)	Minor (2)	**Low**	Medium	Operations
	Environmental Factor: Terrestrial Ecosystems											
	Removal of vegetation due to land clearing of site for construction footprint and temporary work areas	Removal of native flora including: Eucalyptus spp over woodland over grassland	Loss of biodiversity on the Cox Peninsula	Unlikely (2)	Moderate (3)	**Medium**	> Land clearing only to be undertaken in approved areas and as per NT land clearing guidelines > Avoidance of significant and valuable vegetative communities > Any areas temporarily cleared are to be rehabilitated using native seed	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Clearing of potential fauna habitat for construction footprint and temporary work areas	Removal of fauna habitat	Injury of death of fauna or destruction of habitat	Unlikely (2)	Moderate (3)	**Medium**	> Land clearing only to be undertaken in approved areas and as per NT land clearing guidelines > Pre-clearance trapping and relocation of identified fauna	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Noise, vibrations and lighting at Mandorah due to construction activities	Noise, vibrations and lighting impacting fauna	Loss of habitable area for fauna	Unlikely (2)	Minor (2)	**Low**	> Contractor to develop a Noise Management Plan > Lighting only focused on works, not surrounding habitat, light shields if needed	Rare (1)	Minor (2)	**Low**	Medium	Construction
	Fire ignition due to construction activities	Uncontrolled fire	Loss or damage to terrestrial ecosystems	Possible (3)	Minor (2)	**Medium**	Contractor to develop a Fire Management Plan	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Dust generation due to construction activities	Generated dust settling on terrestrial ecosystems	Adverse health impacts to local flora if dust settles on foliage	Likely (4)	Minor (2)	**Medium**	Contractor to develop a Dust Management Plan including but not limited to the following: > Watering of temporary roads and stockpile areas; > Watering down affected vegetation; > Use of dust suppression equipment; and > Speed limits within on site roads.	Unlikely (2)	Minor (2)	**Low**	Medium	Construction

Theme	Environmental Aspect	Risk Pathway(s)	Potential Impacts	Likelihood	Potential Consequence	Inherent Risk Rating	Risk Management/Mitigation	Residual Likelihood	Residual Consequence	Residual Risk Rating	Level of Certainty	Project Phase
LAND	Vehicular movement into site carrying weed species	Introduction of weeds to site	Loss of native biodiversity on the Cox Peninsula due to pressure from introduced species	Possible (3)	Moderate (3)	**Medium**	Contractor to develop a Weed Management Plan including but not limited to the following: > Review and relevant weed mapping and signpost areas of significant weed infestation; > Vehicle washdown stations; and > Routine monitoring of infestations and controls.	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Application of water as a dust control measure	Contaminated water from water storage facilities or dust suppression measures adversely impacting vegetation	Loss of vegetation if contaminants leach into soils	Unlikely (2)	Minor (2)	**Low**	> Water storage facilities to be located away from vegetation > Water used for dust suppression shall be of suitable quality	Rare (1)	Minor (2)	**Low**	Medium	Construction
	Increased vehicle traffic during construction activities	Increased likelihood of vehicle strike	Death or injury to fauna	Possible (3)	Moderate (3)	**Medium**	> Training for all drivers and operators on local fauna most likely to be encountered > Suitable speed limits into and around site	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Increased vehicle traffic during operations	Increased likelihood of vehicle strike	Death or injury to fauna	Possible (3)	Moderate (3)	**Medium**	> Signage to watch out for wildlife > Suitable speed limits into and around site	Rare (1)	Moderate (3)	**Low**	Medium	Operations
	Asbestos contamination encountered on Lot 50	Expose asbestos fibres to ecosystems	Adverse health impacts to local fauna	Unlikely (2)	Minor (2)	**Low**	> If asbestos is encountered when clearing Lot 50, material is to be removed and disposed of by trained personnel	Rare (1)	Minor (2)	**Low**	Medium	Construction
	Increase in noise due to increased patronage	Noise impacting fauna	Loss of habitable area for fauna	Possible (3)	Minor (2)	**Medium**	> Fencing/pathways designed to keep pedestrians away from bush	Rare (1)	Minor (2)	**Low**	Medium	Operational
	Increase in litter due to increased patronage	Fauna mistaking little for food source	Death or injury to fauna	Possible (3)	Minor (2)	**Medium**	> Adequate number of well lit bins provided	Rare (1)	Moderate (3)	**Low**	Medium	Operational
	Lighting at extended car park and ferry terminal	Light impacting fauna	Loss of habitable area for fauna	Possible (3)	Minor (2)	**Medium**	> Lights to focus on car park and ferry terminal > Minimise light intrusion into surrounding environment	Rare (1)	Minor (2)	**Low**	Medium	Operational
WATER	*Environmental Factor: Hydrological Processes*											
	Construction of expanded carpark and ferry terminal adding to the impermeable surfaces	Increase in the quantity of surface water runoff	Localised flooding	Rare (1)	Insignificant (1)	**Low**	No treatment needed. Runoff flows directly into Darwin Harbour in pre- and post-development scenarios	Rare (1)	Insignificant (1)	**Low**	Medium	Construction and Operations
	Environmental Factor: Inland Water Environmental Quality											
	Construction activities including earthworks and building works	Construction materials, sediment and / or contaminants entering surface water features or groundwater	No notable surface water features in proximity to works, runoff to be discharged directly to Darwin Harbour and not expected to infiltrate into groundwater	Rare (1)	Insignificant (1)	**Low**	No treatment needed. Runoff flows directly into Darwin Harbour in pre- and post-development scenarios	Rare (1)	Insignificant (1)	**Low**	High	Construction
	Environmental Factor: Aquatic Ecosystems											
	N / A											
	Environmental Factor: Coastal Processes											
	Changes to local coastal processes	> Installation of breakwaters will interrupt nearshore hydrodynamics, wave and sediment transport, altering erosion > Localised changes to nearshore hydrodynamic wave climate due to installation of the harbour	> Changes to local hydrodynamics and wave climate may impact marine ecosystems, flora and fauna.	Possible (3)	Minor (2)	**Medium**	Intended effect of facility. Design to minimise footprint and interruption of coastal processes outside of harbour.	Unlikely (2)	Minor (2)	**Low**	Medium	Operations
	Environmental Factor: Marine Environmental Quality											
	Disturbance of marine sediments (fines)	Dredging actions, spoil transfer and disposal, rock placement and piling	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	Likely (4)	Moderate (3)	**High**	> Model dredging and disposal actions to properly understand dredge plume dispersion > Gain an understanding of sensitive marine environmental receptors and their tolerance > Control actions to maintain water quality below appropriate thresholds (i.e. altering dredging activities [e.g. volumes, locations] to limit sediment resuspension, dredging only on certain tides etc.)	Unlikely (2)	Minor (2)	**Low**	High	Construction

Theme	Environmental Aspect	Risk Pathway(s)	Potential Impacts	Likelihood	Potential Consequence	Inherent Risk Rating	Risk Management/Mitigation	Residual Likelihood	Residual Consequence	Residual Risk Rating	Level of Certainty	Project Phase
SEA	Release of contaminants from marine sediments	As per actions above - predominantly dredging and disposal	> Toxic contaminants made available to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	Possible (3)	Moderate (3)	**Medium**	> Characterise material to be disturbed to understand locations and levels of contamination > Assess levels of contamination against appropriate thresholds, given the nature of the receiving environment > Isolate, remove and confine areas where contamination is potentially toxic to the marine environment	Unlikely (2)	Minor (2)	**Low**	High	Construction
	Introduction of contaminants/pollution to marine environment	Construction activities - inappropriate waste disposal, accidental oil/chemical spill	> Toxic contaminants introduced to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	Possible (3)	Moderate (3)	**Medium**	> Inspection and audit of vessels and plant, controlled via DSDMP and CEMP > Reporting and response protocols should a spill occur - oil/chemical spill response etc.	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Release of sediments from land	Disturbance/stockpiling of material on land, lost due to run-off, wind etc.	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	Possible (3)	Minor (2)	**Medium**	> Controlled by CEMP > Appropriate stockpiling technique and location > Prevention by bunding, erosion control etc. > Response plan for release of material	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Disturbance of marine sediments (fines)	Rock placement and piling	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	Almost Certain (5)	Minor (2)	**Medium**	> Model dredging and disposal actions to properly understand dredge plume dispersion > Gain an understanding of background conditions > Gain an understanding of sensitive marine environmental receptors and their tolerance > Control actions to maintain water quality below appropriate thresholds	Possible (3)	Insignificant (1)	**Low**	High	Construction
	Release of contaminants from marine sediments	Rock placement and piling	> Toxic contaminants made available to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	Possible (3)	Moderate (3)	**Medium**	> Characterise material to be disturbed to understand locations and levels of contamination > Assess levels of contamination against appropriate thresholds, given the nature of the receiving environment > Isolate, remove and confine areas where contamination is potentially toxic to the marine environment	Possible (3)	Insignificant (1)	**Low**	High	Construction
	Introduction of contaminants/pollution to marine environment	Construction activities - inappropriate waste disposal, accidental oil/chemical spill	> Toxic contaminants introduced to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	Possible (3)	Moderate (3)	**Medium**	> Inspection and audit of vessels and plant, controlled via DSDMP and CEMP > Reporting and response protocols should a spill occur - oil/chemical spill response etc.	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Release of sediments from land	Disturbance/stockpiling of material on land, lost due to run-off, wind etc.	> Elevated suspended sediment concentration in marine water > Sedimentation in marine environment > Potential impact to benthic communities and other biota	Possible (3)	Minor (2)	**Medium**	> Controlled by CEMP > Appropriate stockpiling technique and location > Prevention by bunding, erosion control etc. > Response plan for release of material	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Siltation of harbour	Proposed breakwaters lower velocities in the harbour and allow the settlement of suspended particles	> Smothering of seabed with fine particles impacting marine flora / fauna	Almost Certain (5)	Minor (2)	**Medium**	> Siltation modelling undertaken to estimate rates of accumulation > Benthic habitat has already been identified and removed as part of initial dredging campaign	Unlikely (2)	Minor (2)	**Low**	High	Operations
	Introduction of contaminants/pollution to marine environment	Boat ramp use - inappropriate waste disposal, accidental oil/chemical spill	> Toxic contaminants introduced to marine ecosystem for biological uptake and bioaccumulation > Potential impact to ecosystem health	Possible (3)	Moderate (3)	**Medium**	> Inspection and audit of vessels and plant, controlled via DSMP and CMP > Reporting and response protocols should a spill occur - oil/chemical spill response etc.	Unlikely (2)	Minor (2)	**Low**	Medium	Operations
	Environmental Factor: Marine Ecosystems											
	Dredger/vessel movement	> Vessel strike of marine fauna such as dugongs, turtle, dolphins > Underwater noise impacts due to dredging and piling > Direct impact to seabed - marine ecosystems	> Vessel strike of marine fauna > Injury to marine fauna > Damage to ecosystems	Possible (3)	Moderate (3)	**Medium**	> Vessel movement controls, speed limits, no-go zones > Marine fauna observation and avoidance > Piling controls (soft start) to allow fauna to leave area	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Dredging	Direct removal of benthic communities and habitat	> Permanent removal/destruction of BCH such as seagrass and coral	Almost Certain (5)	Major (4)	**Very High**	> Characterise BCH in direct impact footprint > Minimise footprint and avoid sensitive receptors/important BCH where possible	Likely (4)	Moderate (3)	**High**	High	Construction
	Dredging	Elevated suspended sediment concentration (turbidity) in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (blocking of light) > Impact to marine fauna due to ingestion/dermal contact	Likely (4)	Moderate (3)	**High**	> Characterise BCH in vicinity of project > Characterise dredge plume dispersion to understand changes to water quality with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	Unlikely (2)	Minor (2)	**Low**	Medium	Construction

Theme	Environmental Aspect	Risk Pathway(s)	Potential Impacts	Likelihood	Potential Consequence	Inherent Risk Rating	Risk Management/Mitigation	Residual Likelihood	Residual Consequence	Residual Risk Rating	Level of Certainty	Project Phase
SEA	Dredging	Sedimentation of seabed in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (smothering)	Likely (4)	Moderate (3)	**High**	> Characterise dredge plume dispersion to understand sedimentation levels with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Dredge spoil disposal	Elevated suspended sediment concentration (turbidity) at disposal site	> Impact to sensitive BCH such as coral and seagrass (blocking of light) > Impact to marine fauna due to ingestion/dermal contact	Likely (4)	Moderate (3)	**High**	> Select disposal area for optimum dispersion and minimum sensitive receptors > Characterise disposal dispersion to understand changes to water quality with respect to tolerance of BCH/fauna > Implement dredging disposal controls and reactive monitoring to maintain levels below thresholds	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Dredge spoil disposal	Sedimentation of seabed at disposal site	> Impact to sensitive BCH such as coral and seagrass (smothering)	Likely (4)	Moderate (3)	**High**	> Select disposal area for optimum dispersion and minimum sensitive receptors > Characterise disposal dispersion to understand sedimentation levels with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Dredger/vessel movement	> Vessel strike of marine fauna such as dugongs, turtle, dolphins > Underwater noise impacts due to dredging and piling > Direct impact to seabed - marine ecosystems	> Vessel strike of marine fauna > Injury to marine fauna > Damage to ecosystems	Possible (3)	Moderate (3)	**Medium**	> Vessel movement controls, speed limits, no-go zones > Marine fauna observation and avoidance > Piling controls (soft start) to allow fauna to leave area	Unlikely (2)	Minor (2)	**Low**	Medium	Operations
	Construction activities including earthworks, building works and transport to site	Construction materials and /or general litter entering marine environment	> Ingestion/injury of waste by marine fauna > Damage to marine ecosystems	Possible (3)	Moderate (3)	**Medium**	> Control of waste as per CEMP > Reporting and response to pollution events > Control of construction access/activities	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Rock placement and piling	Direct removal of benthic communities and habitat	> Permanent removal/destruction of BCH such as seagrass and coral	Almost Certain (5)	Moderate (3)	**High**	> Characterise BCH in direct impact footprint > Minimise footprint and avoid sensitive receptors/important BCH where possible	Likely (4)	Minor (2)	**Medium**	High	Construction
	Rock placement and piling	Elevated suspended sediment concentration (turbidity) in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (blocking of light) > Impact to marine fauna due to ingestion/dermal contact	Likely (4)	Moderate (3)	**High**	> Characterise BCH in vicinity of project > Characterise dredge plume dispersion to understand changes to water quality with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Rock placement and piling	Sedimentation of seabed in vicinity of project	> Impact to sensitive BCH such as coral and seagrass (smothering)	Likely (4)	Moderate (3)	**High**	> Characterise BCH in vicinity of project > Characterise dredge plume dispersion to understand sedimentation levels with respect to tolerance of BCH/fauna > Implement dredging controls and reactive monitoring to maintain levels below thresholds	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
AIR	*Environmental Factor: Air Quality*											
	Dust generated by construction activities including earthworks, building works and transport to site.	Decrease in local air quality	Impacts to local fauna and human health through inhalation of particles	Almost Certain (5)	Minor (2)	**Medium**	Integration of dust management measures in construction management plan including: > Watering of temporary roads and stockpile areas; > Use of dust suppression equipment; and > Speed limits on site roads.	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Mobile plant at site and trucking of materials to site	Carbon dioxide emissions	Impacts to local fauna and human health through inhalation of emissions	Almost Certain (5)	Minor (2)	**Medium**	Integration of air quality measures in construction management plan including: > Isolating plant from workers where possible; and > PPE	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Environmental Factor: Atmospheric Processes											
	Energy usage during construction of facilities	Direct emissions from mobile plant, dredger, generators etc.	Cumulative impact of carbon emissions to global climate change	Likely (4)	Insignificant (1)	**Medium**	> Effeciency in design to minimise quantity of rock needed in breakwaters, causeway and boat ramp; > Materials should be transported to site with the minimum number of vehicles required; and > Reuse of existing building onsite for ferry terminal to reduce new materials required;	Possible (3)	Insignificant (1)	**Low**	Medium	Construction
	Future power usage at the ferry terminal	Indirect emissions from use of electricity	Cumulative impact of carbon emissions to global climate change	Likely (4)	Insignificant (1)	**Medium**	Integration of electricity reduction measures in construction management plan including: > Energy saving devices; and > Consideration of alternative energy sources where possible	Possible (3)	Insignificant (1)	**Low**	Medium	Operations
	Environmental Factor: Community and Economy											

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PEOPLE	Construction activities including earthworks and building works	Noise generated	Decrease in liveability for nearby residents, ferry users or tourists	Possible (3)	Minor (2)	**Medium**	Integrate noise management measures within the construction management plan	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Trucking in of construction materials	Increase in traffic along Cox Peninsula Road and Charles Point Road	Traffic delays and increased risk of accident for local residents of the Cox Peninsula	Likely (4)	Minor (2)	**Medium**	> Traffic management plan to be implemented to manage any disruptions to local traffic > Staggering of heavy vehicles throughout the day to minimise congestion	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Construction activities including earthworks and building works	Loss of access to existing carpark	Decrease in liveability for users of existing boat ramp or carpark	Almost Certain (5)	Minor (2)	**Medium**	> Stakeholder engagement with current uses of facilities to inform of access issues during construction	Almost Certain (5)	Minor (2)	**Medium**	High	Construction
	Environmental Factor: Culture & Heritage											
	Aboriginal sacred sites	Construction activities disturbing or destroying Aboriginal Sacred Sites south of the works	Permanent or temporary damage or contamination of Sites	Possible (3)	Moderate (3)	**Medium**	> Response and reporting procedures should a site or obje	Rare (1)	Moderate (3)	**Low**	High	Construction
	Cultural heritage sites / artefacts	Dredging, disposal and associated actions	Disturbance of known or unknown cultural heritage areas during dredging	Possible (3)	Moderate (3)	**Medium**	> Gain understanding of cultural heritage of the site and establish no work areas around heritage sites > Response and reporting procedures should a site or object be encountered	Unlikely (2)	Moderate (3)	**Medium**	High	Construction
	Increased patronage in the area due to upgraded marine facilities	Disturbance or destruction of Aboriginal Sacred Sites south of the works	Permanent or temporary damage or contamination of Sites	Unlikely (2)	Moderate (3)	**Medium**	> Signage to alert the public of private driveways and land to the south of the carpark	Rare (1)	Moderate (3)	**Low**	Medium	Operations
	Environmental Factor: Human Health											
	Asbestos contamination encountered on Lot 50	Inhalation of airborne asbestos	Adverse health impacts to site workers and users of facility	Possible (3)	Moderate (3)	**Medium**	> Staff to have sufficient training in handling asbestos > Appropriate PPE provided to all staff working with, or suspected to be working with asbestos	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Personnel working outside	Exposure	> Sunburn and heat stress > Injury due to cyclone or storm whilst on site	Likely (4)	Moderate (3)	**High**	> Staff to have appropriate PPE (long sleeved shirt, pants, hats, sunscreen etc.) to minimise risk of sunburn and heat stress > First aid kits located around site for initial response > Development of a cyclone response plan and regular monitoring of local news channels	Possible (3)	Moderate (3)	**Medium**	Medium	Construction
	Personnel working outside	Biting insects, snakes, crocodiles	> Injury due to bite/attack > Disease transmitted by biting insect	Possible (3)	Moderate (3)	**Medium**	> Staff to have appropriate PPE (long sleeved shirt, pants, repellent etc.) to minimise risk of biting insects > Staff to have sufficient training on the identification of reptiles likely to be encountered on site > If a problem crocodile is encountered it should be reported to (08) 8983 2475 > First aid kits located around worksite to provide initial response to incidents	Unlikely (2)	Moderate (3)	**Medium**	Medium	Construction
	Construction activities including earthworks and building works	Open fire ignited by construction activities	> Minor, serious or fatal burns to personnel > Smoke inhalation	Unlikely (2)	Moderate (3)	**Medium**	> Staff to have sufficient training in fire management > Fire extinguishers located around site > Smoking and hot works in permitted areas only	Rare (1)	Major (4)	**Medium**	Medium	Construction
	Proximity to vegetation	Exposure to bushfire	> Minor, serious or fatal burns to personnel > Smoke inhalation	Unlikely (2)	Major (4)	**Medium**	> Creation of a bushfire evacuation plan > Staff to have sufficient training in fire management > Regular monitoring of local news channels	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Public accessing breakwaters and / or jetty during construction	Slip, trip or fall into water above head height	> Accidental entry to deeper water leading to drowning hazard	Unlikely (2)	Major (4)	**Medium**	> Fencing and signage to prevent public access to breakwater and jetty	Rare (1)	Major (4)	**Medium**	Medium	Construction
	Dredging and disposal of contaminated sediments	> Disturbance/release during extraction, transport and placement stages > Release to the marine environment following placement, then bioaccumulation and biomagnification in the food chain	> Dermal contact > Inhalation > Ingestion	Possible (3)	Moderate (3)	**Medium**	See management measures relating to marine environmental quality. These apply to risk to humans also, with risk to human health considered a lower risk.	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Dredging and disposal of fine sediments	> Disturbance/release during extraction, transport and placement stages	> Dermal contact > Inhalation	Possible (3)	Moderate (3)	**Medium**	> Sediments to remain wet or be contained as part of disposal > Segregation of work area and material from general public	Rare (1)	Moderate (3)	**Low**	Medium	Construction
	Public accessing breakwaters and / or jetty during construction	Slip, trip or fall into water above head height	> Accidental entry to deeper water leading to drowning hazard	Unlikely (2)	Major (4)	**Medium**	> Fencing and signage to prevent public access to breakwater and jetty	Rare (1)	Major (4)	**Medium**	Medium	Operations

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	Emissions from construction plant	Exposure of workers to emissions	Irritation to workers	Possible (3)	Minor (2)	**Medium**	> Avoiding idling of construction plant > Isolating workers from fumes > PPE such as masks and faceshields > Alternative power source	Unlikely (2)	Minor (2)	**Low**	Medium	Construction
	Public access to breakwaters and jetty	Slip, trip or fall into water above head height	> Accidental entry to deeper water leading to drowning hazard	Possible (3)	Major (4)	**High**	> Signage to notify public of dangers and that the breakwaters should not be accessed during dangerous conditions	Unlikely (2)	Major (4)	**Medium**	Medium	Operations