Kimberley Supply Chain Cluster EIA

Supporting Document

Crestlink Pty Ltd

28 March 2025

→ The Power of Commitment

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Executive Summary

Crestlink Pty Ltd (formerly Kimberley Technology Solutions Pty Ltd) is referring the Kimberley Supply Chain Cluster (formerly Cockatoo Island Multi-User Supply Base) (the Proposal) to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986*. This supporting document has been prepared to provide additional information to supplement the s38 Referral, and to assist the EPA to assess the Proposal.

The Proposal would establish a multi-user supply chain and logistics hub comprising of an upgraded airfield, a wharf and an aftermarket subsea workshop as well as other related support infrastructure.

Seven Key Environmental Factors were identified for the Proposal and an assessment of significance was undertaken for each factor:

Benthic communities and habitat

The Project will result in the direct loss of 0.54 ha of hard coral and macroalgae, of which 0.3 ha is very sparse hard coral. Species are represented in adjacent bays in much higher densities and coverage. Some colonisation by marine species will occur on the wharf structures and fill used for land reclamation. As this bay has very little primary producer habitat compared to the adjacent bays, there is unlikely to be a significant impact to local biological diversity and ecological integrity and the EPA's objectives will be met.

Coastal processes

The new wharf will run parallel to the shoreline and will not significantly affect or interrupt longshore current movements or existing coastal processes.

Any residual impacts on sedimentation, geomorphology, current speeds and patterns will be localised and restricted to the vicinity of the wharf. Therefore, the EPA's objective will be met.

Marine environmental quality

The Proposal does not involve dredging or any planned discharge and is not expected to interrupt longshore currents.

Impacts will be largely confined to the construction phase and limited to the immediate area of construction that is largely dominated by unvegetated sandy environs.

There is not expected to be any significant risk to maintaining environmental values of the water, sediment and biota through the construction or operational phases and hence the EPA's objectives will be met.

Marine fauna

Given the proposed mitigation measures, lack of known critical marine fauna habitat in the impacted bay, the Proposal activities are not expected to result in any significant effects on marine fauna. There is the potential for some impacts to intertidal and shallow fauna within the reclamation footprint, but progressive construction in the offshore direction will allow motile marine fauna to relocate.

During reclamation construction, there is likely to be behavioural avoidance of the area but not direct physical trauma to large marine fauna. Any impacts to behaviour will be limited to transient individuals near the activity, as the area is not significant for cetaceans or turtles. Migrating species that pass through the area will be able to navigate around any point source disturbance.

With adherence to the management controls proposed, potential impacts are considered acceptable, and the EPA's objectives will be met.

Terrestrial vegetation

The impacts to terrestrial vegetation are based on the loss of 7.37 ha of native vegetation. No threatened species or communities have been recorded or are likely to occur on Cockatoo Island and clearing will remove less than 5% of the remaining area of Eucalyptus woodland present across the Island. No conservation significant flora will be impacted.

Drainage will be designed to minimise the risk of impact to downslope vegetation during construction and operations.

The EPA's objectives for terrestrial vegetation will be met.

Terrestrial fauna

The Proposal will result the loss of 7.37 ha of habitat for fauna, including foraging habitat suitable for some conservation significant species.

Some direct loss of reptile and SRE fauna may occur because of vegetation clearing and ground disturbance but this is unlikely to affect conservation significant species as most are nocturnal and arboreal and can move away from the disturbance area.

The availability of other suitable habitat on Cockatoo Island and on adjacent islands and the mainland is likely to ensure the survival and continued presence of the conservation significant species recorded.

Potential operational impacts are unlikely to significantly affect fauna presence or diversity.

Actual and potential impacts to terrestrial fauna and their habitats are not considered to be significant, due to the amount of existing disturbed habitat and to other, existing factors such as the availability of significant areas of adjacent habitat of similar, or better, quality. Therefore, the EPA's objectives for terrestrial fauna will be met.

Terrestrial Environmental Quality

The proposal has the potential to introduce hydrocarbon contamination through spills as well as mobilisation of contaminants through erosion and runoff.

Given the proposed mitigation measures, no detrimental effects are anticipated to Terrestrial Environmental Quality as a result of the Proposal and the EPA's objectives for will be met.

Social Surrounds

Impacts to Aboriginal heritage will be avoided. Consultation with Traditional Owners has been and will continue to be undertaken during the construction of the Proposal. A joint heritage survey was completed in July 2023, with the Traditional Owners and KTS representatives. The survey team members were confident that their cultural sites of significance are located outside the Proposal area and Indigenous Land Use Agreement (ILUA) area and are confident with their decision that the proposed ILUA area is cleared for all ground disturbing activities by KTS with no conditions.

Given the remote location of the Proposal Area, no significant impacts to amenity are anticipated. Therefore, the EPA's objectives will be met.

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Abbreviations and Acronyms

Abbreviation	Definition
AHD	Australian Height Datum
BCH	Benthic Communities and Habitats
CD	Chart Datum (approx. 0 mLAT)
CEMP	Construction Environmental Management Plan
CID	Cockatoo Island Datum
DAFF	Department of Agriculture, Fisheries and Forestry
DCCEEW	Department of Climate Change, Energy, Environment and Water
DotEE	Department of Environment and Energy
DPaW	Department of Parks and Wildlife
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EP Act	*Environment Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FAT	Facility Acceptance Testing
g	Gram
ha	Hectare
HEPA	High Ecological Protection Area
HF	High Frequency
HPU	Hydraulic Power System
Hz	Hertz
IBRA	Interim Biogeographic Region of Western Australia
ILUA	Indigenous Land Use Agreement
IMS	Invasive Marine Species
IWOCS	Intervention Workshop Control System
KEF	Key Environmental Factor
kHz	Kilohertz
km	Kilometre
KTS	Kimberley Technology Solutions Pty Ltd
kV	Kilovolt
L	Litre
LAT	Lowest Astronomical Tide
LCT	Large Carrier Tank
LCTV	Large Crew Transfer Vessel
LEPA	Low Ecological Protection Area
LF	Low Frequency
LGA	Local Government Area
m	Metre
m^2	Square metre
m^3	Cubic metre
m/s	Metres per second

Abbreviation	Definition
MARPOL	International Convention for the Prevention of Pollution from Ships
MCP	Master Control Panel
MEPA	Moderate Ecological Protection Area
MEQ	Marine Environmental Quality
mg/L	Milligrams per litre
mg/kg	Milligrams per kilogram
ML	Million litres
OEMP	Operational Environmental Management Plan
PEC	Priority Ecological Community
PSV	Platform Supply Vessel
SCP	Spill Contingency Plan
SEL	Sound Exposure Level
SMPEP	Shipboard Marine Pollution Emergency Plan
SOPEP	Shipboard Oil Pollution Emergency Plan
SS	Suspended Solids
t	Tonne
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
TSV	Trans Shipment Vessel
UNIA	Underwater Noise Impact Assessment
ZoHI	Zone of High Impact
ZoI	Zone of Influence
ZoMI	Zone of Moderate Impact

1. Introduction

1.1 Purpose of this document

Crestlink Pty Ltd (Crestlink, formerly Kimberley Technology Solutions [KTS]) is referring the Kimberley Supply Chain Cluster (formerly the Cockatoo Island Multi-User Supply Base) (the Proposal) to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act). This supporting document has been prepared to provide additional information to supplement the s38 Referral, and to assist the EPA to assess the Proposal.

1.2 Overview of the Proposal

Crestlink proposes to construct and operate the Proposal from Cockatoo Island.

The Proposal would establish a multi-user supply chain and logistics hub comprising of an upgraded airfield, a wharf and an aftermarket subsea workshop as well as other related support infrastructure.

The Proposal would support the exploration, development and operation of oil and gas projects in the Browse Basin. It will also increase opportunities for other strategic industries such as Defence and Tourism in north-western Australia and may reduce the operating costs of mining on Cockatoo Island.

The Proposal, complements services provided by mainland hubs, offering a closer multi-user supply base to the northern parts of Australia and the Indo-Pacific region. This distinctive service, combining all-tide access marine facilities with aerodrome operations, is unparalleled in the region. The new facility is expected to attract business and trade to the broader Kimberley region, facilitating cost-effective logistics solutions, greenhouse gas emission reductions, and will be supported by mainland ports and airports of Broome and Derby to access the island.

1.3 The Proponent

The Proponent for the Proposal is Crestlink Pty Ltd.. Contact details for the Proponent are:

Mr Eanna Doolin

Crestlink Pty Ltd

Unit 2, 76 Hasler Rd, Osborne Park WA 6017

Ph: 08 9429 5600

ACN: 615 631 386

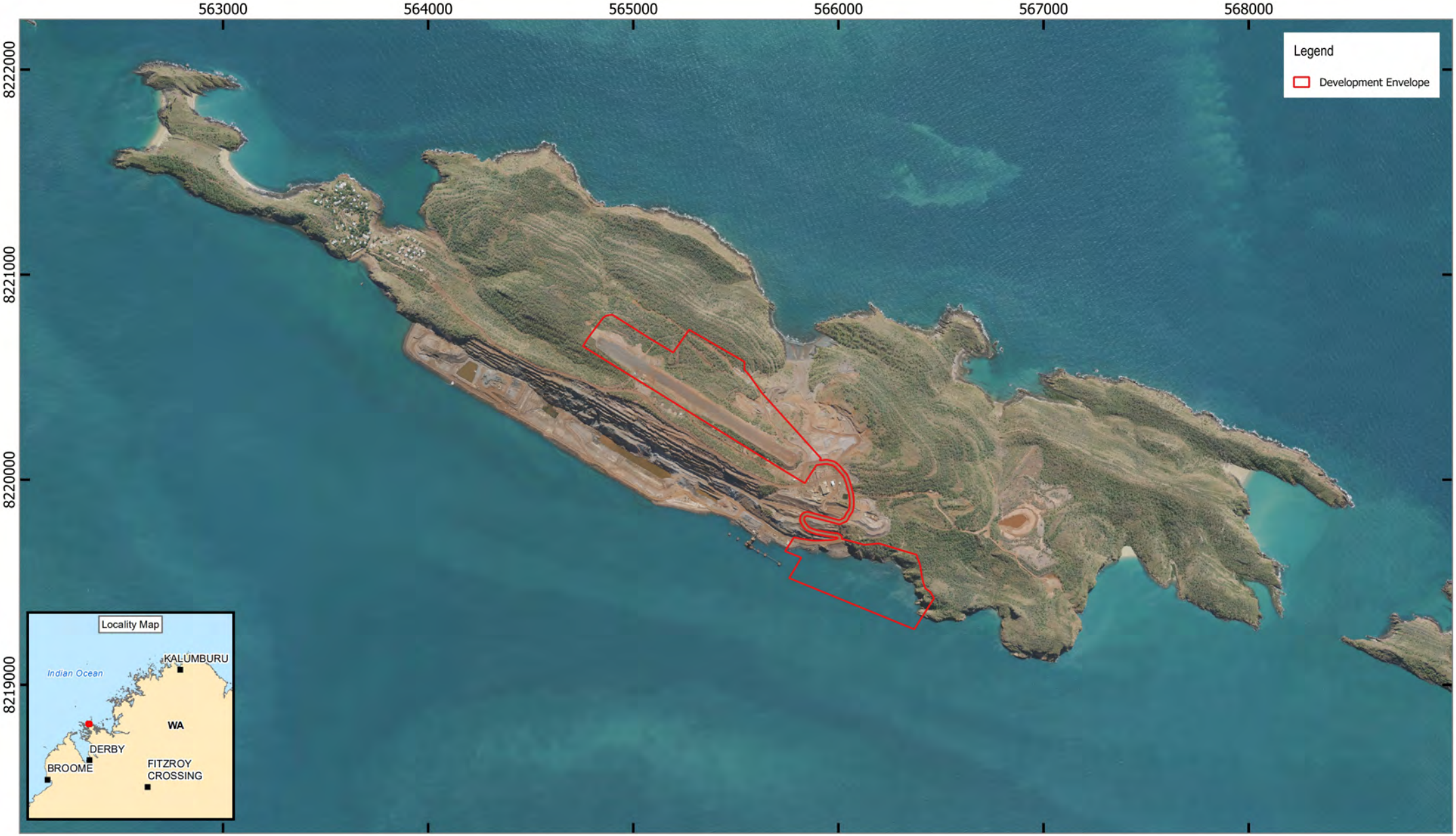
1.4 Location of the Proposal

Cockatoo Island is located approximately 7 km off the Western Australian coast within the Buccaneer Archipelago, approximately 130 km north of Derby (Figure 1.1). Cockatoo Island is located within Yampi Sound, between Irvine and Koolan Islands.

Cockatoo Island has historically been mined for iron ore, with mining operations on the Island commencing in 1951. There are two Mining Leases on Cockatoo Island, M04/235-I and M04/448-I.

– M04/235-I is currently in a regime of care and maintenance and current operations are restricted to site visits and minor repair work only.
– M04/448-I is active, and the re-commencement of ore shipping is anticipated in Q2 of 2025.

Existing infrastructure and disturbances on the Island include an airstrip, processing plant, open pit, a permanent seawall, a wharf and a historic township.



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Map Projection: Mercator Auxillary Sphere
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Grid: MGA Zone 51

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Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Location

Project No. **12526793**
Revision No. **A**
Date. **28/03/2025**

FIGURE 1-1

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2. The Proposal

2.1 Proposal justification

The Proposal will:

- Provide a safer offshore operation during the petroleum life cycle by reducing flight duration and numbers and enabling a more effective Search and Rescue (SAR) solution
- Revamp safety procedures in cyclone and emergency response. It accelerates the de-manning and remanning processes for offshore assets during cyclone events
- Significantly reduces GHG emissions from operating and future oil and gas and other offshore operations by significantly reducing aviation and marine fuel usage
- Create a unique business model that pairs a deep water port and aerodrome operations on an offshore island that is strategically located to support multiple industries and entice businesses away from the traditional Asian hubs to the shores of WA, thereby potentially increasing jobs for Australians
- Be complimentary to the existing regional ports and airports and intends to increase trade to the region. Cockatoo Island operation compliments the major land base ports and airports to support the offshore operations with key feeder hubs considered to be Broome and Derby.
- Make best use of existing assets without substantial government funded capital upgrades, allowing for a staged development approach
- Transfer technology and knowledge from proven international locations to enhance Australian local content and skills base
- Support mining operations on Cockatoo Island by reducing logistics costs
- Assist nearby mining operations through shared services and an expansion of service providers within the key Kimberley towns
- Centralise selected hi-tech services for Browse Basin oil and gas operators currently having to rely on subsea support from further afield (Asian ports and Darwin)
- Link into the supply chain corridor between Perth and Singapore.

2.2 On-shore developments

Onshore island developments will primarily consist of an expanded and upgraded airstrip for fixed wing aircraft and helicopters, airfield support facilities, laydown areas and site roads.

2.2.1 Airfield, laydown and roads

Airfield

The revised airfield, apron and support infrastructure footprint has been reduced to 7.37 ha (a reduction of 42.5 ha) from the original proposal. The revised design follows the alignment of the existing airstrip, incorporating an apron to the north of the airstrip, and utilises existing support infrastructure.

The design follows the alignment of the existing airstrip which reduces the disturbance footprint, makes use of existing locally quarried rock and where possible, will make use of a locally based earthmoving fleet and support system to reduce mobilisation/demobilisation.

Drainage from the airfield will be directed to table drains for infiltration on site. These will be designed and constructed to capture and infiltrate surface water runoff for a 1 in 100 ARI, preventing the mobilisation of contaminants.

Terminal and hangars

An aviation terminal will be constructed adjacent to the runway and the proposed structure will be approximately 50 m x 25 m.

The helipad will be designed to accommodate a 2 or 3-bay hangar.

Fuel storage

Jet A1 refuelling for helicopters will be undertaken on site. All fuel will be stored above-ground in self-bunded fuel tanks within an area adjacent to the helipad. Fuel will be transported to the island by barge in articulated trailer tanks that will be decanted and returned to the mainland for filling. The total capacity of the stored fuel will not exceed 100,000 L of Jet A1 (five pods). Filling of helicopters will be done by a dedicated fuel delivery system that will draw fuel from the pods.

Diesel for generators and mobile plant will be stored in a dedicated bunded area. Diesel will arrive by barge in drums, articulated trailer tanks or a fuel barge and will be transferred to the storage area for distribution.

Fuel storage areas will have appropriate spill response equipment.

Utilities

The proposed location of the apron and terminal are close to the existing Island bores. This supply will service the ablution facilities and will be filtered to provide potable water.

Sewage will be treated in a contained septic tank system.

Power will be provided to the terminal by a dedicated diesel genset (between 150 kV and 500 kV) with backup.

Laydown and roads

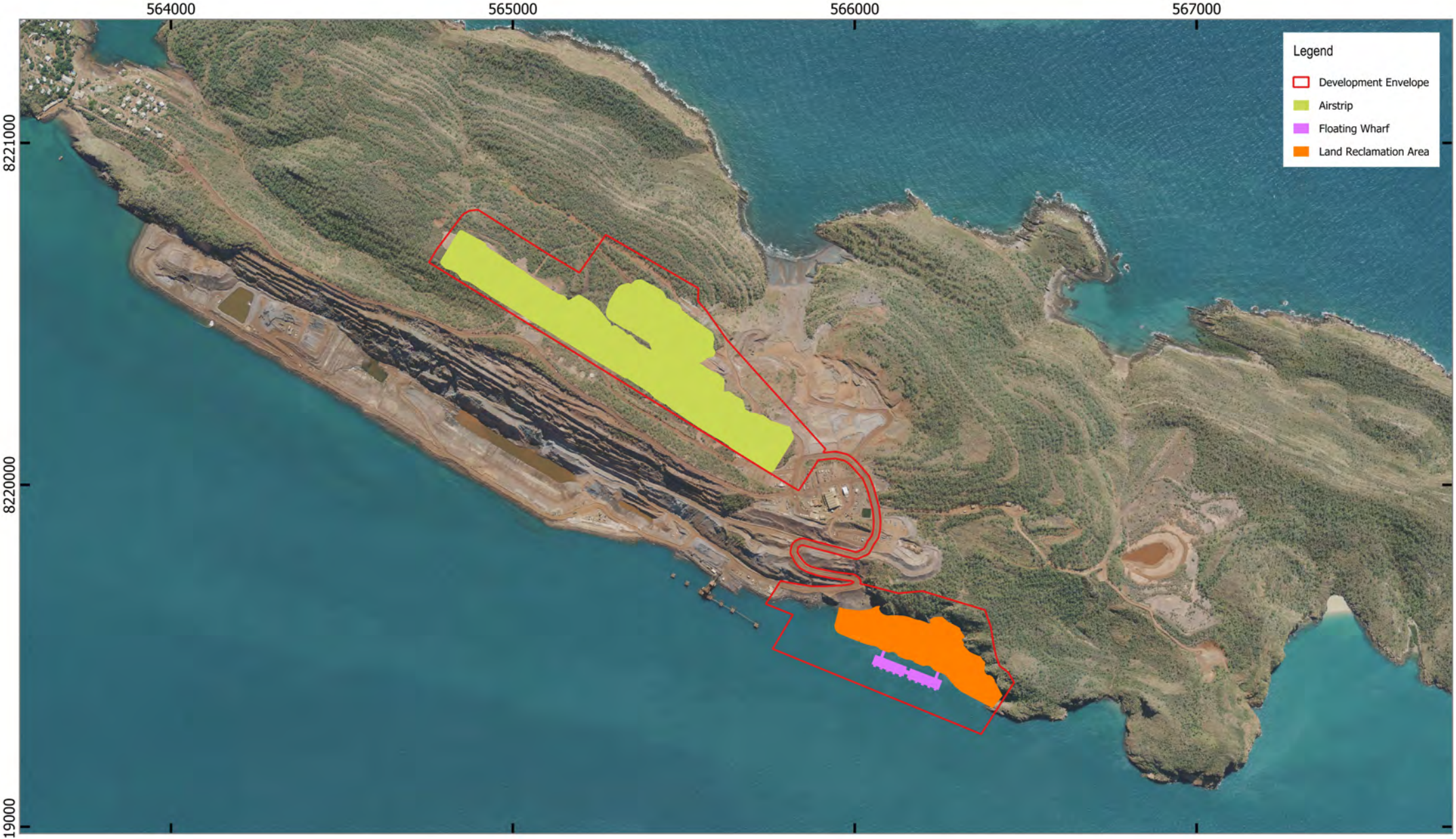
Some land adjacent to the airfield and the wharf (Figure 2.1) will be used for:

– Laydown (overflow from the wharf) of pipe, umbilical reels, containers of spares and parts, drilling equipment and bulk materials etc
– Construction support
– Offices
– Workshop and warehousing.

Construction support will comprise a demountable site office and less than 20 accommodation units. These will be relocated or dismantled when not required. It is intended to make use of the permanent accommodation on the island for staff and occasional visitors.

Additional offices, warehouses and workshops will be developed in the future if demand exceeds available space at the wharf.

A road will link the airfield to the wharf (Figure 2.1). This makes use of an existing haul road to the mining tenement. A short extension will be required to connect this haul road to the wharf.



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Cockatoo Island Multi-User Supply Base

Layout of Proposal Elements

Project No. **12526793**
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Date. **28/03/2025**

FIGURE 2-1

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2.2.2 Construction

Construction will disturb up to approximately 7.37 ha of land (Figure 2.2).

Clearing for the airfield and laydown areas will be undertaken by bulldozer, grader or similar. Cleared vegetation will be respread on areas being rehabilitated including those associated with the mine.

The geology of the area to be levelled indicates that bands of hard rock are present. Where rock excavation is required, ripping with a bulldozer and/or drill and blast will be the methods used and loose rock will be moved by excavator and truck to areas requiring fill.

The airfield will be sealed with bitumen and a temporary bitumen plant will be mobilised.

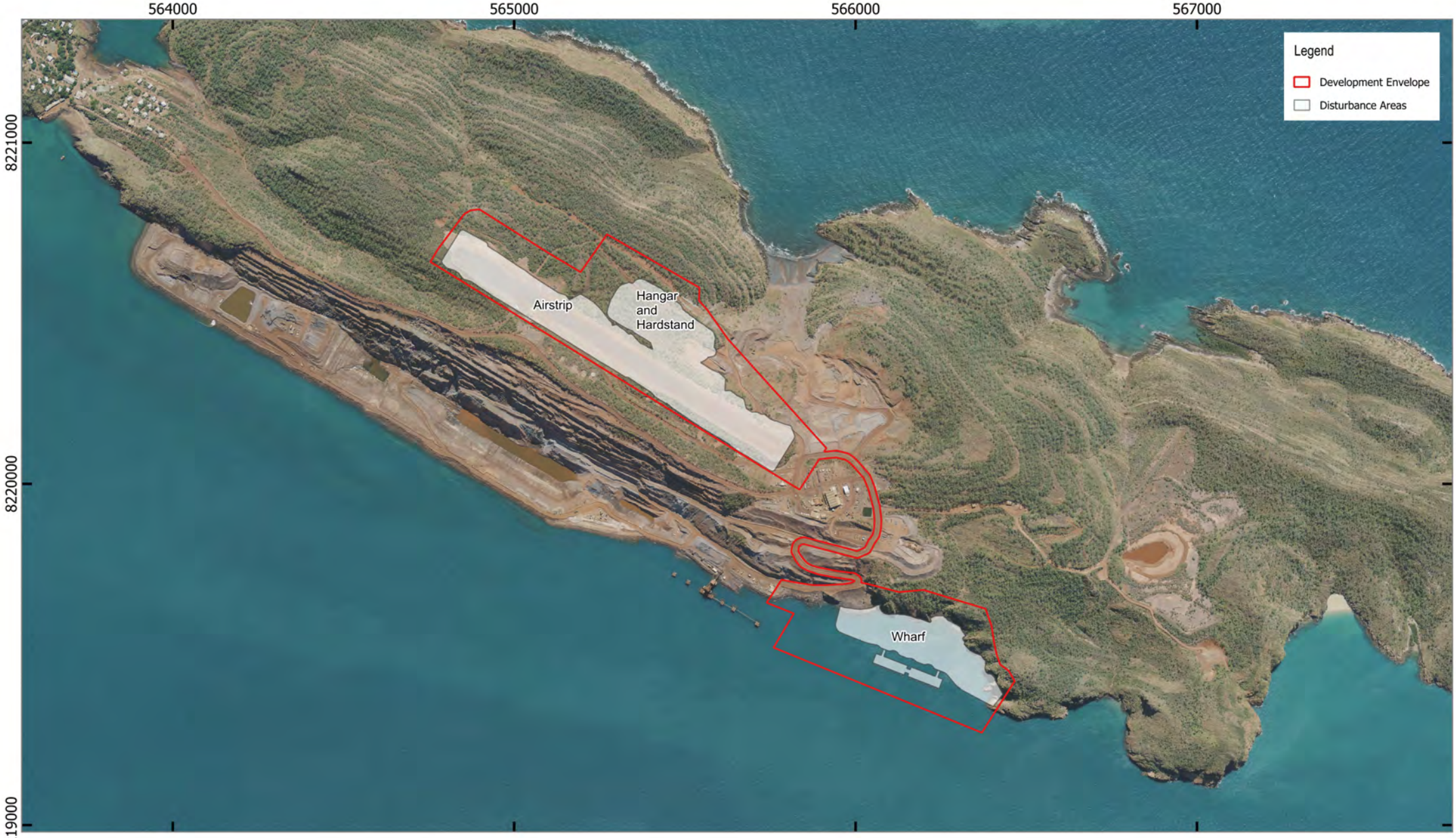
Construction materials for buildings will be barged to the Island, offloaded and erected on-site.

Putrescible wastes will be disposed at the existing licensed landfill on the Island. There is also an existing metal dump for disposal of metal waste. Waste hydrocarbons will be removed from the Island for reprocessing. Wastes that cannot be disposed onsite will be transferred to the mainland by barge for disposal.

2.2.3 Operations

With a single client, air traffic will consist of five Regional Jets and eight to ten helicopter cycles (take-off and landing) per week. Where multiple clients use the facility, these numbers may increase. Typically, fixed wing aircraft will only operate during daylight hours with helicopters operating both day and night. There may be instances where fixed wing aircraft will use the facility at night, but this is not expected to occur often.

Waste materials during operations will be disposed in a similar manner to construction wastes.



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Cockatoo Island Multi-User Supply Base

Disturbance Areas

Project No. **12526793**
Revision No. **A**
Date. **28/03/2025**

FIGURE 2-2

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2.3 Marine developments

The bay to the east of the existing ship loader has a suitable profile for development of a wharf. The bay comprises a beach/mudflat at low tide with a drop off to between 10 and 20 m at Lowest Astronomical Tide. T The Kimberley Ports Authority (KPA) have granted Crestlink two Leases and License for the port project. They are the Construction Works Lease and Licence (CWLL) and the Terminal Operating Lease and Licence (TLL), with separate leases for Phase 1 and Phase 2 of the development. The Lease Term is 21 years, with two options of 14.5-year extensions, totalling 50 years, matching the same term durations requested for the Crown Lease.

2.3.1 Wharf

Wharf

The wharf will consist of a Roll On Roll Off (RORO) ramp to permit barge loading and unloading operations and has the capacity to cater for up to four floating wharf modules, each approximately 30m x 100m in plan that have a minimum freeboard of 2.5m and to the east, a subsea workshop.

The RORO ramp will form part of the infilled revetment and the wharf modules will be linked to the land via structural access trestles. The wharf furniture consists of bollards, floating fenders chained to the wharf berthing face, and safety ladders. Dolphins and mooring buoys may also be required to support safe mooring of vessels.

This design will allow for access at all stages of the tide, reduce the footprint on the seabed and reduce cost of construction (refer to Figure 2.3 that illustrates the location of two of the four floating wharfs).

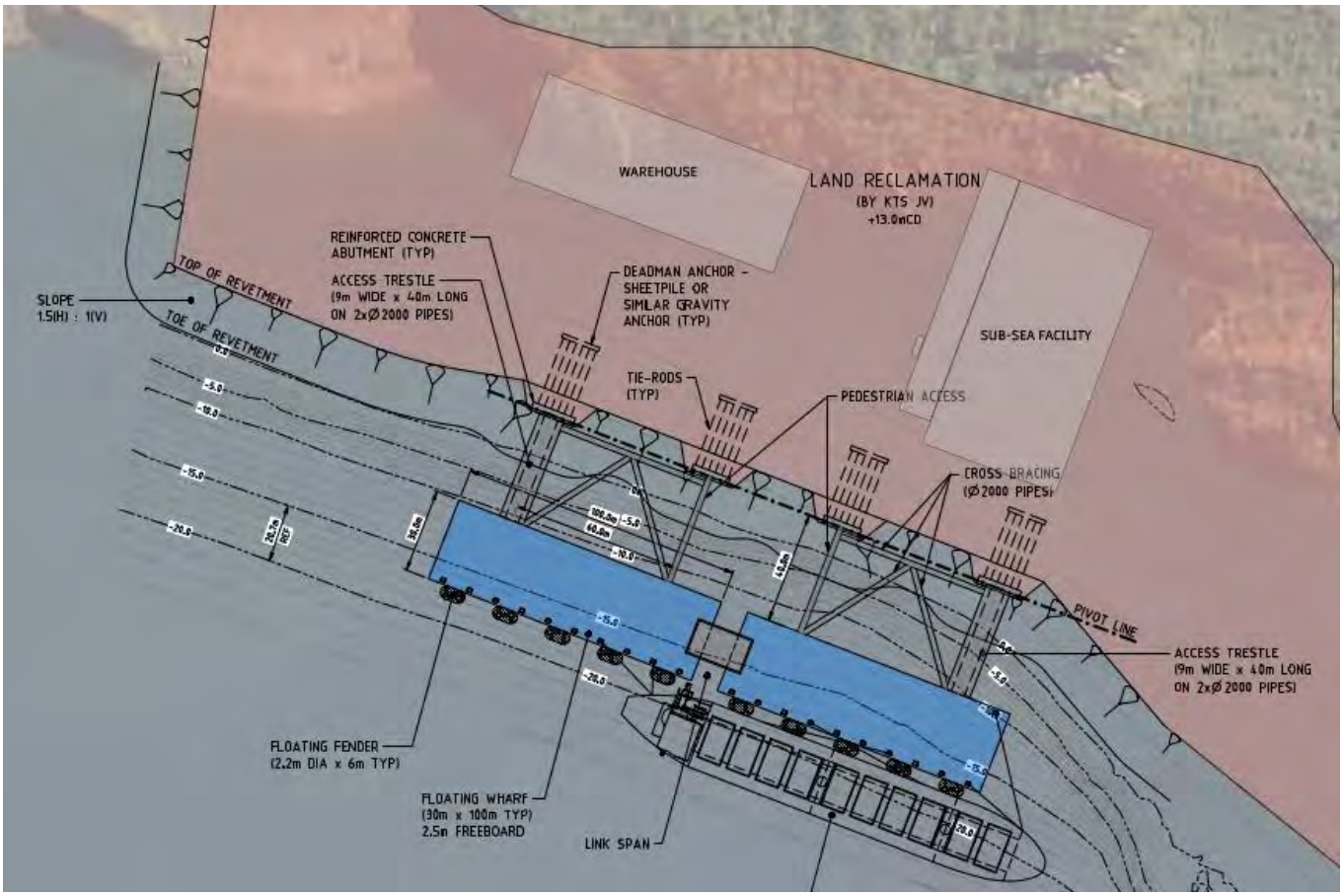


Figure 2.3 Schematic of proposed wharf

The access road to the wharf is shown in Figure 2.1.

The facility will provide fuel, water & cargo services to marine vessels, as well as facilitate crew change and waste disposal and includes the following facilities and equipment:

– Tanks – approximately 1 ML of marine gas oil in self-bunded tanks and approximately 0.5 ML of potable and/or drilling water. Final location will be subject to detailed design
– Warehouse – approximately 100 m x 40 m (Cyclone rated)
– Diesel and hydraulic fluids in drums within bunded and covered areas
– Laydown areas – demarcated on the wharf for pipe, umbilical reels, containers of spares and parts, drilling equipment and bulk materials
– Lighting to allow for night works
– Mobile Cranes – 80 t
– Generators, one operating and one on standby (between 150 kV and 500 kV)
– Contained grey and blackwater treatment plant.

Subsea workshop

The workshop will provide subsea aftermarket support such as:

– Receiving subsea components (trees)
– Systems Integration Testing (SIT)
– Factory Acceptance Testing (FAT)
– Control System servicing and testing and repair
– Storage of control modules such as Intervention Workover Control Systems (IWOCS), Master Control Panels (MCP) and Hydraulic Power Systems (HPU)
– Storage of tools and parts.

The workshop will be approximately 96 m x 50 m, of steel and Colourbond construction, and cyclone rated (Figure 2.4).

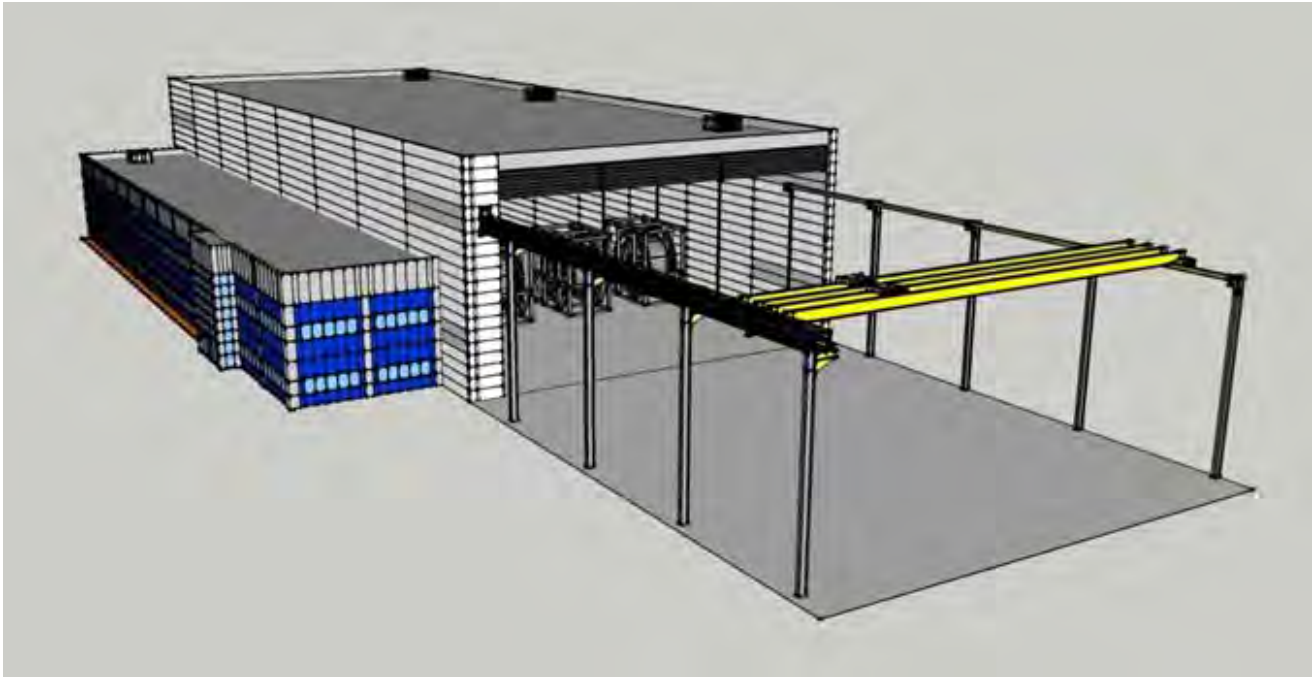


Figure 2.4 Schematic of proposed subsea workshop

The workshop will be integrated with a gantry crane that can access the quayside. The workshop portion will contain a test pit that can be flooded and discharged. The test pit will service equipment designed to operate on the seabed so there is minimal risk of water contamination within the pit and the discharge water. The test pit is isolated from the surrounding seawater.

Power will be supplied by 2 x 500 kV gensets, one active and one on standby.

Sewage will be collected in tanks and transferred to the septic tank system at the airstrip for disposal.

2.3.2 Construction

When the wharf is developed to its full extent, it has a land reclamation area of approximately 5.8 ha and will require approximately 700,000 m^3 of fill to raise the level of the platform to approximately 3m above high tide. The RORO ramp will be constructed to form part of the infilled revetment.

The wharf area will sit atop reclaimed seabed on the leeward side of the Island. The wharf, essentially a hardstand area built out into the ocean will require a rock armour sea wall to protect it from ocean activity. It is proposed to place a rock blanket layer over the reclamation area via dump trucks and excavators (Plate 1). This will enable construction vehicles such as trucks to deliver and place armour rock along the edges of the reclaimed area. The hardstand will be progressively raised commensurate with the rise in the sea wall construction.

Core taken from the stockpile site will be hauled for placement at the 'tip heads'. At the tip head Core shall initially be placed by direct tipping from the dump trucks. loaders will push and level core out where applicable. Upon establishment of the core rock perimeter, the long reach excavator shall prepare the foundation for the rock armour and filter layers. Filter material and general fill material will be placed in layers to suit the technical requirements including the installation of geofabrics and geotextiles as required.

Once sufficient Filter or Geotextile has been placed the armour rock shall be brought to the work front by dump truck. The dump truck shall tip the armour rock onto the work bench for placement by loader and/or 50t excavator.

Plate 1 Armour Stone Placement

The topography of the seabed together with the tides experienced at Cockatoo favour the development of a deadman anchor or similar gravity anchor system that ties a floating wharf to the shore (refer to Figure 2.3). A steel bracing structure links the shore to the anchor system that also provides pedestrian and vehicle access from land to the wharf.

No dredging will be required.

A heavy lift crane will likely be mobilised to connect the floating wharf to the infilled revetment.

The floating wharves, structural steelwork and other construction materials for buildings, facilities and infrastructure will be barged to the Island, offloaded and erected on-site.

Putrescible wastes will be disposed at the existing licenced landfill on the Island. There is also an existing metal dump for disposal of metal waste. Waste hydrocarbons will be removed from the island for reprocessing. Wastes that cannot be disposed onsite will be transferred to the mainland by barge for disposal.

A proposed marine construction schedule is provided in Table 2.1 below.

Table 2.1 Proposed marine construction schedule

Task	Duration	Year 1												Year 2	
		Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Marine	**380 days**														
Earthworks Construction	276 days														
Pavement	57 days														
Bitumen Seal	16 days														
Rock Armour	70 days														
RORO Pocket Works	40 days														
Deadman Anchor	38 days														
Access Trestle	70 days														
Floating Wharf	83 days														
Marine Commissioning	7 days														

2.3.3 Operations

Activity at the wharf will be dependent on drilling and construction campaigns and traffic will vary as a result. A single wharf has been designed to cater for 5-10 Platform Supply Vessels (PSV) (or similar) calls per week, two Large Carrier Tank (LCT) calls per week and one to two other industry calls per month (defence and tourism). Where multiple clients use the facility, these numbers may increase.

Operations will occur 24/7 as required.

Waste materials during operations will be disposed in a similar manner to construction wastes.

Crestlink may also handle and dispose of waste streams as part of the services offered at Cockatoo Island, aligning with established practices at Broome and Darwin facilities. The proponent may collect and/or transfer offshore waste, including hydrocarbon-contaminated materials (sludges, sediments), hazardous waste, domestic and general industrial waste. These will be temporarily stored in designated containment areas at Cockatoo Island, such as bunded storage tanks, lined waste pits, or secured hazardous waste containers, before transport via barges to approved onshore facilities in Derby or Broome.

The proposed process follows established practices at Broome and Darwin ports, ensuring compliance with environmental standards. Onshore on the mainland ports, waste will be segregated, treated, recycled, or disposed of according to its classification. Hydrocarbon-contaminated waste will undergo bioremediation, recyclable materials such as scrap metal and e-waste will be processed at licensed recycling facilities, and non-recyclable or hazardous materials will be disposed of at licensed hazardous waste facilities. Disposal locations and methods will align with regulatory requirements and client environmental plans. Crestlink will ensure compliance with environmental standards and industry best practices in waste management.

2.4 Staging

The preceding discussion identifies the ultimate development for the Proposal.

However, to take into account activities associated with end user requirements, there is flexibility to progressively develop the Proposal.

Staging could include:

– Initially bitumising the existing airstrip and upgrading the existing terminal building to allow helicopter operations only (approximately 600 m long runway)
– Progressive development of the airstrip to 1,200 m
– Construction of the new terminal based on passenger demand
– Construction of the helipad based on demand
– Construction of the wharf and marine facility in stages, for example, RORO ramp and a single berth extending to four in the future
– Marine revetment area infilled in stages to match the berthing requirements above.

2.5 Proposal Alternatives

Cockatoo Island is in a unique location to provide supply base infrastructure critical to reduce GHG emissions for industries that are centred offshore in the Kimberley and serve as the region’s biggest economic contributors. In addition, with increasing geopolitical tensions the location is considered optimal for future protection of these industries and the wider community by Australia’s Defence force.

Cockatoo Island has already undergone significant disturbance compared to other islands that are located in similar positions, it is within a designated port and has designated shipping channels from the years of iron ore

mining since the 1950's and hence marine mammals have become accustomed to the shipping activities to and from the area compared to locating such a facility in another location. As such there are no other locations that provide such a strategic location as Cockatoo Island.

Crestlink has made every effort to reduce the amount of disturbance to a minimum. Revisions to the proposal have resulted in a reduction in clearing from 42.5 ha to 7.37 ha.

Minimising Extent of Land Clearing

The project reduced the overall footprint and associated vegetation clearing through a reduction to the proposed runway length, associated laydown, roads and supporting facilities. Figure 2.5 below illustrates the reduction in the overall project development area with further detail provided in Table 2.1.. Refer to the 'Section 43a notice of decision to consent to amend a referred proposal during assessment' for more details.

Retaining Existing Assets and Facilities

Crestlink has made every effort to retain existing buildings and facilities where possible to reduce the proposal footprint. For example, the re-orientation of the airstrip to retain the existing Terminal Building and bunker and using existing island access tracks to access the proposed facilities instead of constructing new roads and laydowns.

Lowest Impact Port Location

Three possible port locations illustrated in Figure 4-1 were considered on the southern side of the island based on their degree of disturbance and benthic habitat and evidence of coral distribution. .

A clear conclusion was drawn that locating the wharf facility in Bay 1 resulted in the lowest impact to benthic communities and habitat as discussed in Section 4.3.4.

Table 2.2 Summary of Reduction in extent of clearing

Proposal Element	Initial extent, capacity or range	Proposed	Proposal Element
Physical Elements			
Airfield, apron and support infrastructure	Total footprint of 36.46 ha (with no more than 20.61 ha of vegetation clearing) within the 52.66 ha Development Envelope.	Reduction in both overall footprint of 17.76 ha and vegetation clearing of 13.24 ha.	18.84 ha (with no more than 7.37 ha of vegetation clearing).
Laydown Areas	Total footprint of 15.17 ha (with no more than 13.45 ha of vegetation clearing).	Removal of all proposed laydown areas.	0 ha
Roads	Total footprint of 1.03 ha (with no more than 0.17 ha of vegetation clearing).	No clearing or construction required.	0 ha
Wharf	Land reclamation of approximately 6.18 ha	Reduction in land reclamation of 0.43 ha and addition of 0.82 ha of floating infrastructure.	Land reclamation of no more than 5.75 ha and floating infrastructure of area 0.82 ha (contained within the 52.81 ha Development Envelope).
Construction elements			
Land Reclamation	756,000m^3 of fill (benign mine waste)	Reduction in fill volume of 56,000m^3 based on smaller footprint.	Up to 700,000m^3 of fill (benign mine waste)

Figure 2.5 Map of illustrating reduced project footprint

3. Stakeholder consultation

Crestlink has completed an extensive stakeholder engagement program outlining the Proposal to the key government departments and stakeholder groups. There is engagement and ongoing dialogue with Cockatoo Iron Mining Pty Ltd, Pearl Gull Iron Pty Ltd (mining lease holders on Cockatoo Island) and the Traditional Owners and Native Title holders of Cockatoo Island, the Dambimangari.

A joint Crestlink and Dambimangari heritage survey was completed in July 2023. The Dambimangari survey team members were confident that their cultural sites of significance are located outside the proposed ILUA and confident with their decision that the Proposal area and proposed ILUA area is cleared for all ground disturbing activities by Crestlink with no conditions. A copy of the heritage survey report has been provided to the EPA on a confidential basis to provide evidence of these outcomes.

Table 3.1 provides a summary of stakeholder engagement activities, outlining the key stakeholders consulted, the date of engagement, the issues and topics raised, and the proponent's response or outcomes. This table highlights the concerns, feedback, and recommendations from various parties and details how the proponent has addressed or incorporated them into the project planning and decision-making process.

Table 3.1 Stakeholder engagement details

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
AMSA	Dec-24	– AMSA Aviation – Discussion on AMSA's reliance on contractors for rotary and fixed-wing operations (PHI, CHC/OSA, Police, Aviair). – Crestlink's need to engage directly with operators, not AMSA, to secure revenue. – Review of aerodrome specifications for AMSA operations. – Infrastructure needs for fuel resupply, climate-controlled storage for perishable equipment, and accommodation requirements for AMSA operations on Cockatoo Island. – Coordination on marine contact for AMSA and a follow-up update on progress in the new year.	– AMSA contracts aviation operations for rotary fixed wing (uses Police aircraft for fixed wing) Cockatoo Island infrastructure could support AMSA operations with fuel resupply, storage, and accommodation. AMSA aerodrome requirements depend on operator specifications.
	Dec-24	– AMSA Marine – AMSA's jurisdiction and responsibilities in Western Australia. – The growing maritime activity in the Kimberley and associated risks. – Emergency response capabilities, including towing arrangements. – Coordination between AMSA, Fisheries, Parks, and DoT for vessel safety and inspections. – State vs. Commonwealth water boundaries and jurisdiction. – Search and Rescue (SAR) responsibilities and key contacts at DoT.	– AMSA oversees safe shipping, crew changes, and pollution prevention but not SAR. – Kimberley is a high-priority region due to vessel activity and remoteness. – AMSA conducts vessel inspections with Fisheries and Parks. – Emergency towing arrangements exist nationwide. – State waters extend to 3nm, Commonwealth waters from 3 to 15nm. – DoT handles SAR
Cockatoo Iron Mining Pty Ltd	Aug-21	– Consulted via DEMIRS as part of the Crown Lease approval process. – Letter of support provided for project	– Continue engagement and discussion on project development. – Potential source of borrow material for project construction
	Feb-24	– Consulted via DEMIRS as part of the Crown Lease approval process.	– Continue engagement and discussion on project development. – Access agreement to be developed once project commences
Dambimangari Aboriginal Corporation (Dambimangari)	Aug-22	– Dambimangari & KTS ILUA Heads of Agreement – KTS and the Dambimangari Aboriginal Corporation (DAC) have been in discussions for approximately 3 years prior to the execution of the Indigenous Land Use Agreement (ILUA) between DAC, Wanjina-Wunggurr (Native Title) Aboriginal Corporation RNTBC (WWPBC) and KTS in October 2023. – KTS and DAC discussed a Heads of Agreement setting out the terms and process for ILUA negotiations over a period of 24 months before execution. This was undertaken at various meetings at the DAC offices in Derby and via phone calls.	– The execution of the Heads of Agreement enables discussion around the execution of a Co-existence ILUA to progress.
	Jun-23	– KTS & DAC Joint Heritage Survey – A Pre-ILUA Survey Heritage Impact Assessment (HIA) Notice was prepared by KTS in response to a request for more information from DAC's Board members to help inform the ILUA negotiations.	– The Aboriginal Heritage survey was successfully undertaken on the 15th and 16th June 2023. In response to the requirements of the survey as specified in the HIA notice the following outcomes were reported: • Much of the ILUA area has been heavily disturbed by previous activities associated with mining. • All of the cultural heritage sites known to Traditional Owners are located outside of the proposed ILUA area. • Development activities within the ILUA area will not directly impact areas of Aboriginal cultural concern. • The proposed ILUA area was cleared for all ground disturbing activities with no conditions • A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System revealed that there are no Registered Sites nor any Other Heritage Places on Cockatoo Island. • It is confirmed that there are no known Aboriginal heritage sites mapped within the Proposal Area. Under the terms of the ILUA, KTS will continue to consult with DAC closely during the construction and operation of the project.
	Aug-23	– DAC Members roadshow - KTS Co-existence ILUA – DAC undertook their own engagement via dedicated presentations to members in Perth, Port Hedland, Ardyaloon (One Arm Point) and Mowajum Community (Derby) over the course of a week. – The engagement took the form of an ILUA Roadshow, where DAC staff visited members to present on the project and proposed ILUA in its entirety. – DAC members were provided the opportunity to ask questions about the project and provide feedback / suggestions.	– KTS understands that member feedback with positive with a number of queries addressed and / or incorporated in the ILUA.
	Sep-23	– KTS Co-existence ILUA - Board Approval – The DAC board proposed the approval of the KTS Co-existence ILUA at the Oct '23 AGM.	– The DAC Board noted the positive feedback from the Members roadshow and endorsed the KTS Co-existence ILUA for presentation to the Dambimangari community at the next AGM.
	Oct-23	– Wanjina-Wunggurr (Native Title) Aboriginal Corporation RNTBC (WWPBC) briefing – KTS and DAC presented to the WWPBC Board as part of the ILUA approval process.	– The Board of the WWPBC reviewed and approved the ILUA

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
	Oct-23	– KTS Co-existence ILUA Community Approval – The DAC Board, supported by the KTS management team, presented at the Dambimangari AGM in Derby and answered questions from the community.	– The Dambimangari community voted unanimously to approve and execute the KTS Co-existence ILUA at the Oct 23 DAC AGM.
	Sep-24	– KTS Co-existence ILUA Committee – First meeting of the KTS ILUA Implementation Committee comprising nominated representatives from DAC and KTS	– Commencement of ILUA implementation and agreed actions.
	Nov-24	– KTS Progress Update – The KTS management team presented at the Dambimangari AGM to provide an update to the community.	– There was a question and answer session and a positive response from the attendees.
	Dec-24	– KTS Co-existence ILUA Registration – The National Native Title Tribunal confirmed the CrestlinkCo-existence ILUA was registered on 16 Dec 2024.	–
	Feb-25	– Finalisation of the State CrestlinkIndigenous Land Use Agreement – The State CrestlinkILUA was sent to the National Native Title Tribunal for registration on 20 Feb 2025.	– Awaiting Registration.
	Mar-25	– Letter of Support – DAC CEO provided a letter of support for the Project in response to queries raise in the Environmental Approvals process.	– Engagement between Crestlink and DAC is regular and ongoing, including through an Implementation Committee established under the ILUA, and reflects DAC's support for the project on the terms agreed.
Defence	May-22	– Minister of Defence – Development of a multi-user supply base on Cockatoo Island, including upgrades to airstrip, wharf, and subsea workshop. – Potential benefits and opportunities for Defence due to the island's proximity to the Australian coastline and Yampi Sound Training Area. – Need for Defence to better understand the scope of proposed works and potential strategic value.	– Provided Defence with detailed information on proposed infrastructure and operational capabilities. – Engaged with Defence to explore potential collaboration and alignment with Defence needs. – Ongoing discussions to assess strategic opportunities for Defence operations at Cockatoo Island.
	Oct-23	– Navy Engagement - Canberra – Defence's potential future need for a port facility at Cockatoo Island. – Strategic importance of additional berthing options in north-western Australia. – Potential use of Cockatoo Island for Defence adaptability and rapid response. – Design considerations for wharf infrastructure to accommodate Navy vessels. – Coordination between Defence and the proponent on future infrastructure compatibility. – Potential for Cockatoo Island to support both Defence and commercial marine operations.	– Defence acknowledges the potential strategic value of additional berthing options in north-western Australia. – Defence provides generic berthing requirements to inform future wharf design. Wharf design will consider class-agnostic specifications to accommodate current and future Navy vessels. – Ongoing engagement with Defence will continue to ensure alignment with future strategic needs. – The proposal remains independent of any formal commitment from Defence or the Australian Government. – The proponent will assess opportunities for dual-use infrastructure to support both Defence and commercial operations. – Further discussions may be held if Defence's operational requirements evolve in the future.
	May-24	– Fuel Services Branch – Defence interest in continued discussions with KTS, even in early study phases. – Parallel study by Defence Theatre Logistics, with plans to share KTS information. – Recommendation for KTS to visit Darwin to engage with key Defence personnel on Cockatoo Island's role in Defence logistics, operations, and exercises.	– Ongoing engagement with Defence stakeholders to align project scope with Defence requirements. – Coordination with Defence Theatre Logistics to ensure project alignment with their study. – Scheduling of Defence meetings in Darwin to further discuss Cockatoo Island's logistics role.
	May-24	– North West Defence Alliance – – ADF is aware of Cockatoo and its plans and is included in early regional discussions ADF are having with the Northwest Alliance. – ADF will visit some areas of Kimberley in Nov and a KTS representative plans to be on the ground.	– Continue to engage and update as the project progresses. – Request more details from key ADF members on updates on the DSR. – Continue to use KTS Advisors to provide feedback to the project team to ensure project is developed in line with ADF requirements.
	Sep-24	– Met with the Defence, Estate and Security Group to brief them on the Project with the objective of providing some insight to our infrastructure due to the peaked interest in remote infrastructure bases in the north of Australia.	– Project was noted and welcomed and understood it was privately invested. – Airfield engineer provided some technical advice on aerodrome. – Project updates to be provided when appropriate.
	Feb-25	– Australian Border Force / Marine Border Command / Operation Sovereign Borders – Presented project Aviation and Marine infrastructure plans at Cockatoo and timeline – Provided details on proposed specification and asked if the facility would be of use to the ABF/MBC/OSB	– ABF has operational need for suitable maritime fuel and water options in the Kimberly Marine Park. – ABF helicopter operations are active but are unlikely to be major users of the airfield. – New use case options such as Intelligence, Surveillance and Reconnaissance may offer entry – Requested to be kept up to date with project progress.

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
Department of Energy, Mines, Industry Regulation and Safety	Feb-24	– DPLH and JTIS led the engagement with DEMIRS on behalf of the project. – Crestlinksubmitted a revised crown lease application to DPLH who sought DEMIRS approval.	– DEMIRS is satisfied that the protections outlined in section 117 of the Mining Act and Annexure A – Additional Provision adequately safeguard all mining interests on the Island. – DEMIRS encourages KTS to finalize an Access Agreement with CIM. – Approval has been granted under section 16(3) of the Mining Act 1978 for the grant of a section 79 LAA lease and a section 144 easement over Crown land and reserve 22493 (FNA 17293 and FNA 17294 in Tengraph). – Approval has also been granted under section 91(5) of the LAA for the issuance of a license in favour of KTS for early access and feasibility studies (FNA 17219 in Tengraph), subject to conditions.
Department of Jobs, Tourism, Science and Innovation (JTSI)	Various Meetings 2019 to 2025	– JTSI appointed as the lead agency in 2019 and liaising with other government agencies on Crestlinkbehalf. – Ongoing coordination with JTSI to ensure alignment of project objectives with state development priorities. – Regular meetings to streamline approval processes for major infrastructure and industrial projects. – Facilitation of stakeholder engagement, including coordination with local communities, government agencies, and industry groups. – Discussions on investment promotion and facilitation to attract domestic and international investment for the project. – Ongoing consultations for industry development, focusing on innovation and economic growth in key sectors. – Meetings to ensure compliance with regulatory requirements, providing guidance on navigating the project approval processes. – Continuous policy and strategic advice to ensure the project aligns with state tourism, science, and innovation goals. – Updates on project support from JTSI in terms of resolving project-related issues and facilitating timely approvals. – JTSI fully support project.	– Regular meetings with JTSI ensured alignment with state development priorities, refining project objectives and confirming mutual support. – Collaboration with JTSI clarified regulatory approval processes, resulting in streamlined approvals and clear project timelines. – Active engagement with stakeholders, facilitated by JTSI, strengthened relationships and identified potential challenges early. – JTSI's investment promotion facilitated increased investor interest and identified potential financial partners. – Discussions with JTSI identified strategic opportunities for industry development, creating long-term value for the region. – Ongoing meetings with JTSI ensured project compliance with state regulations and a clear understanding of the approval framework. – JTSI's strategic advice aligned the project with the state's economic vision, allowing for necessary adjustments. – JTSI's support helped resolve project challenges and provided clear direction for the next steps.
Department of Mines and Petroleum	Aug-21	– DPLH and JTIS led the engagement with DEMIRS on behalf of the project. – Crestlinksubmitted a revised crown lease application to DPLH who sought DEMIRS approval.	– Due consideration was given to the proposed revised footprint for the KTS' Crown lease. – No objections were raised from CKI/Pearl Gull (subsidiary) regarding the revised Crown lease proposal. – No further comments were received from CIM concerning the revised Crown lease proposal. – The Department of Planning, Lands and Heritage (DPLH) committed to consulting with DMIRS and the Department of Jobs, Tourism, Science and Innovation (JTSI) regarding the drafting of Crown lease conditions. The consultation aims to protect mining operations on Cockatoo Island and other regional industries. – Approval was granted for a 21-year Crown lease, with two possible extension terms in favour of KTS, under section 16(3) of the Mining Act 1978.
Department of Parks and Wildlife	2016	– Triodia sp. Hidden Island – Previously recorded in 2014 near a track north of the airstrip in a historically disturbed area. – In 2016, the site had been burned, and the species could not be re-located. – DPaW advised that assessment should consider baseline habitat, not just post-fire conditions. – Fire was identified as a limitation for the 2016 survey.	– Agreement between GHD and DPaW to undertake further targeted surveys to determine the species' distribution elsewhere on the Island. – a targeted flora survey should be undertaken to determine the distribution of Triodia sp. Hidden Island. This has been completed and the results are presented in GHD (2017a).
	2016	– Threatened and Priority Bat Species – Three bat species recorded on the Island: Ghost Bat, Northern Leaf-nosed Bat, and Little North-western Mastiff Bat. – One cave near the disturbance footprint may be suitable for roosting but is affected by tidal movements. – DPaW's main concern was noise and vibration impacts from blasting during construction. – Concern about increased aircraft flights at night and potential bat strike risk.	– DPaW concluded that no further survey was required for the cave's suitability as roosting habitat. – Minimal expected impact from night flights as no caves are near the airstrip. – The outcome of the discussion indicated that no further survey effort would be required for the Ghost Bat and northern sub-species of the Masked Owl.
	2016	– Northern Sub-species of the Masked Owl – Discussion of previous record of the species on the Island. – Impact of the 2016 fire on woodland habitat and breeding potential. – Few trees with hollows available for roosting.	– Potential impacts should be assessed as if the habitat were pre-fire. – The outcome of the discussion indicated that no further survey effort would be required for the Ghost Bat and northern sub-species of the Masked Owl.

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
Department of Planning, Lands and Heritage	Various Meetings 2023 to 2025	– Negotiations on the appropriate land-based lease structure (e.g., crown lease, easement, facilities agreement) in alignment with DPLH requirements. – Coordination with DPLH regarding crown lease and easement processes on mining tenure. – Consultation with DPLH on the consultation process with traditional owners for development approvals. – DPLH's requirements for land use and zoning compliance for proposed infrastructure projects. – Engagement with DPLH regarding the alignment of project timelines with approval processes. – Negotiation of lease terms and conditions in accordance with DPLH guidelines. – DPLH's role in approving the environmental and planning impact assessments for the proposed developments. – DPLH's role as a Decision-Making Authority under the Environmental Protection Act 1986 (EPA). – Addressing potential land tenure conflicts with DPLH's oversight of crown land and its use for mining or other purposes.	– The lease structure has been confirmed, including the addition of a State Indigenous Land Use Agreement (ILUA) to align with both traditional owner agreements and state requirements. – Draft terms for the Crown Lease, Easement, and Facilities Agreement/Deed with the State have been confirmed, addressing all legal, operational, and environmental considerations. – Discussions on Section 91 license terms are progressing, ensuring compliance with licensing requirements. – DPLH's role as a Decision-Making Authority under the Environmental Protection Act 1986 (EPA) has been confirmed, with lease execution dependent on the Minister for Environment issuing the Ministerial Statement. – Coordination with DPLH regarding the consultation process with Traditional Owners has been completed to ensure cultural heritage and environmental protocols are adhered to. Land use and zoning compliance for proposed infrastructure projects has been ensured in collaboration with DPLH. – Project timelines have been aligned with DPLH's approval processes, with regular engagement to avoid delays. – Environmental and planning impact assessments have been initiated, with DPLH's guidance on approvals and consultation to minimize environmental impacts. – Consultation will continue with DLPH.
Department of State Development	Aug-19	– Letter seeking Major Project Status was issued seeking Major Project Status for the project.	– KTS Cockatoo Island project was accepted by the Western Australian State Government as a major project under the Lead Agency Framework. The Department of Jobs, Tourism, Science and Innovation (JTSI) was appointed the lead agency for the project.
Department of Transport	Mar-20	– Met to discuss sea bed lease with KPA CEO	– At meeting it was agreed to process with seabed lease.
	Feb-21	– Understand impact to project as a result of the transfer from DoT to KPA on ownership of port waters	– Emails shared with KPA CEO to recommence seabed leases under the KPA.
	Jan-25	– Development of the Cockatoo Island Offshore Supply Base in the Kimberley. – Potential value to the Department of Transport (DoT) for marine operations support. – Collaboration with Kimberley Ports Authority (KPA) and finalisation of port leases in June 2024. – Progress on environmental approvals before major construction begins. – Plan to establish marine fuel storage and supply by Q2 2025 as an early-stage development. – Long-term strategy to align facility capabilities with DoT's operational needs. – Planned upgrade of the existing airstrip to create a multi-user logistics hub. – Commitment to incorporating DoT's technical and operational requirements. – No funding or financial commitments sought from DoT. – Invitation to meet or discuss further details at DoT's convenience.	– Confirm the Offshore Supply Base location and address DoT's interest in the development – Engage with KPA to discuss Port of Yampi Sound arrangements and the scope of marine operations within WA State waters – Collaborate with DoT's MEER team to ensure alignment on oil spill risk mitigation and terminal development standards – Offer to meet with DoT and KPA to align expectations and clarify future collaboration
Derby Chamber of Commerce	May-20	– Letter of support received – High unemployment in Derby (~50%) and need for job creation. – Economic benefits for Derby and the West Kimberley through investment and local business opportunities. – Potential for West Kimberley to become a marine hub, reducing CAPEX and OPEX for offshore and mainland developments. – Importance of government and industry support for project success. – Need for training and skills development to support workforce participation. – Opportunities for local businesses to engage and benefit from the project.	– Project will create jobs, providing vital employment for local families and businesses. – The logistics hub will stimulate direct and indirect economic growth in the region. – Infrastructure will attract further investment, making the region a strategic location for marine logistics. – Ongoing engagement with State Government, industry stakeholders, and regulatory bodies to secure support. – Collaboration with TAFE and industry to develop training programs and career pathways. – Commitment to local procurement and supplier engagement to maximize regional benefits.
Kimberley Development Commission (KDC)	Oct-17	– Focus on development of capacity/industry that does not currently exist in WA with majority of landside development opportunity to be in the west Kimberley – Broad concepts and potential for dispersed benefit in the region is understood – Multi-user model preferred (shared industry infrastructure) as is early (immediate) engagement with Nyamba Buru Yawuru on land side opportunity in Broome – Support from DSD could activate assistance with local engagement of regional stakeholders/partners	– Support received was provisionally positive – KDC has suggested holding a workshop with regional stakeholders and KTS to be arranged – KDC seeking documented interest or clearance from Department of State Development (DSD) in the Project – Early (immediate) engagement with Nyamba Buru Yawuru on land side opportunity in Broome
	Jan-22	– Met with Kimberley Development Commission (KDC) and SDWK in Perth City to provide an update on project and investment in the Kimberley region.	– Ongoing engagement with Kimberley Development Commission and SDWK to ensure alignment on regional investment opportunities. – Continue providing updates on project progress and explore potential collaboration opportunities.
Kimberley Ports Authority (KPA)	Apr-21	– KPA lease and licenses discussion to understand next steps Meeting held in Broome with KPA on 20 April 2021 to review draft lease documents.	– Draft lease and licenses received from KPA – Continue discussions over the next 18 months on drafting and legal requirements.
	Aug-23	– Updated leases received from Luke Westlake on 11 Aug 2023.	– Updated lease and licenses reviewed and follow up meeting with KPA to be arranged

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
	Nov-23	– Meeting held at Crestlink office on 22 November 2023 with KPA to go through final legal points on leases and licenses.	– KPA management team positive about presenting to KPA Board for approval. – KTS to prepare presentation for KPA board in Dec 23.
	Dec-23	– KTS Management team presented to the KPA board on 15 December 2023 for formal approval of leases.	– KPA board feedback was positive in the meeting.
	Jan-24	– KPA board approved Leases and Licenses to be sent to Minister for Ports for approval.	– Minister for Ports written to Treasurer on April 12 2024 confirming his approval.
	Apr-24	– Treasurer approval sought from Minister of Ports	– Leases and Licenses with Treasury
	May-24	– Approval from Treasury received 20 May 2024	– Leases and Licenses finalised for Execution.
	Jun-24	– Leases and Licenses Executed 24 June 2024	– KTS continue project development and other necessary approvals.
	Various Meetings 2020 to 2025	– Regular meeting (in person and via teleconference) with KPA management team to discuss port lease and license status.	– Continue regular meetings to discuss project development.
NK5 Group and Cockatoo Is Pty Ltd	Oct-20	– Support for the projects and early discussion on costs to provide support services ongoing.	– Co-operation Agreement executed 22 Oct 202. – Continue engagement and discussion on project development.
	Various Meetings 2020 to 2025	– Regular meeting (in person and via teleconference) with NK5 management team to discuss operational synergies to support operations.	– Continue regular meetings to discuss project development.
Office of the Environmental Protection Authority (EPA) Department of Water and Environmental Regulation (DWER) Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Jun-17	– Kimberley Technology Solutions Pty Ltd is referred the Cockatoo Island Multi-User Supply Base to the Environmental Protection Authority (EPA) under Section 38 of the Environmental Protection Act 1986.	– Subsequent meetings were held as outlined below.
	Jan-18	– EPA issue Notice Requiring Further Information (NRFI)	– Subsequent meetings were held as outlined below.
	Nov-20	– Section 43A application submitted to EPA	– Subsequent meetings were held as outlined below.
	Dec-20	– EPA issue NRFI for s.43A assessment	– Response provided to EPA to satisfy NRFI for s.43A assessment (April 2020)
	Oct-21	– EPA set level of assessment as 'Referral Information with additional information required under section 40(2)(a) of the Environmental Protection Act 1986 (4 week public review)'	– Subsequent meetings were held as outlined below.
	Oct-22	17 October 2022: meeting with EPA Services – The purpose of this meeting was to provide an update to the EPA on the progress of the response to the October 2021 – Notice Requiring Information for Assessment and to discuss: • Whether a Section 43A is required. • Clarifications on several of the DWER requests in the Notice Requiring Information for Assessment (NRIA) dated 20 October 2021. • Need for additional terrestrial and marine baseline data on basis of changes to PMST.	– DCCEEW issued clarification requests in Feb '23
	Dec-22	– 13 December 2022: meeting with EPA Services. Matters discussed included: • Whether a variation of proposal under Section 156A is required for EPBC Referral number 2017/7986. • Proposal reduction in construction noise impacts to marine fauna due to elimination of pile/sheet driving. Controls on construction (e.g. noise impacts albeit considerably lower) and operational (e.g. vessel movements) activities to reduce the likelihood and/or severity of impacts on marine fauna will be incorporated not the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP). • PMST to identify if any threatened or listed species not identified previously. • Assessment to be carried out as an accredited assessment.	– DCCEEW issued clarification requests in Feb '23
	Feb-23	– 15 February 2023: to DCCEW - Clarification Requests The purpose of this letter was to address matters identified during the meeting between KT, GHD, DCCEEW and DWER regarding EPBC Referral 2017/7896.	– Subsequent meetings were held as outlined below.
	Mar-23	– 9 March 2023: to DWER - Section 43A request to change proposal during assessment The purpose of this letter to DWER was to outline the details and supporting information of the Section 43A request to change proposal during assessment. – 10 March 2023: to DCCEW - EPBC Number 2017/7986 – Confirmation of alignment with Variation approved 7 December 2020: The purpose of this letter was to inform DCCEEW that the Proposal description remains in alignment with the Variation that was approved on 7th December. The proposed amendments were also presented in a table in the letter.	– Subsequent meetings were held as outlined below.
	Jul-23	– 12 July 2023: to DWER - Section 43A request to change proposal during assessment:	– Section 43A approved in Nov-23
	Nov-24	– Public submissions period Tuesday, 26 November, 2024 to Tuesday, 7 January, 2025	– Submission comments provided to Crestlink
	Feb-25	– Crestlink preparing responses to submissions	– Responses to be submitted to DWER

Stakeholder	Date	Issues /topics raised	Proponent response / outcome
Pearl Gull Iron Pty Ltd	Aug-21	– Consulted via DEMIRS as part of the Crown Lease approval process. – Letter of support provided for project	– Continue engagement and discussion on project development. – Potential source of borrow material for project construction
	Nov-22	– Memorandum of Understanding (MOU) executed. – Letter of support provided for project	– Continue engagement and discussion on project development. – Potential source of borrow material for project construction
	Apr-22	– Discussions held around airstrip use	– Airstrip Access Agreement executed
	Oct-23	– Requested letter of support for KTS lease	– Letters of Support provided.
	Feb-24	– Consulted via DEMIRS as part of the Crown Lease approval process.	– Continue engagement and discussion on project development. – Access agreement to be developed once project commences
Shire of Derby/West Kimberley	Various Meetings 2016 to 2025	– Regular meeting (in person and via teleconference) with Shire President and CEO to discuss project opportunities for Derby and the region more broadly.	– Continue regular meetings with the Shire President and CEO to discuss project opportunities and regional development. – Maintain open communication to align project objectives with local priorities.
	Nov-19	– Met with president and CEO 11 nov 2019, presentation and update on project to all councillors.	– KTS to continue joint meetings with Derby Shire to inform on Project progress & foster involvement. – Engage & conduct workshops to identify/develop opportunities.
	May-20	– Letter of support requested.	– Letter of support provided.
	Aug-20	– Meeting held to discuss training, education and work opportunities for locals, including TAFE.	– Open discussion to develop a framework TAFE / UWA / SDWK / KTS to develop a pipeline and pathway of training, educational program into higher education via remote learning from TAFE into University and beyond. – Offer young people locally to learn online throughout pre and post-graduation journey – Expand on the job training across a variety industries. – Work life balance and community – Career opportunities locally – Encourage non FIFO workforce – Reskilling all communities and career diversity
	Jan-22	– Met with Kimberley Development Commission (KDC) and SDWK in Perth City to provide an update on project and investment in the Kimberley region.	– Ongoing engagement with Kimberley Development Commission and SDWK to ensure alignment on regional investment opportunities. – Continue providing updates on project progress and explore potential collaboration opportunities.
	Feb-25	– Community presentation in Derby to engage with all local community, provide project updates and gather thoughts from locals.	– Continue community consultations to ensure transparency and incorporate local perspectives
The State of Western Australia	Various Meetings 2023 to 25	– Discussions on lease terms and appropriate legal structure. Conditions discussed to protect existing businesses in region.	– A Deed between the State and the Proponent was considered the most appropriate structure to capture the obligations the State wish to impose on the proponent as part of the Lease. – Deed to be executed in parallel with Crown Lease.

4. Environmental principles and factors

4.1 Principles

Section 4A of the EP Act establishes the object and principles of the Act. In accordance with the EPA's Statement of Environmental Principles, Factors and Objectives (EPA 2016), this section describes how each of the five principles of the EP Act has been applied to the Proposal.

Principle	Consideration of Principle in the Proposal
The precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decision should be guided by: a. careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b. an assessment of the risk-weighted consequences of various options.	Baseline and targeted flora and fauna surveys have been undertaken for the entire area potentially impacted by the Proposal. Information collected builds on information from earlier surveys. No significant impacts are likely from construction and operation of the Proposal. The Proposal will have a relatively small disturbance footprint with the majority of the development occurring on previously disturbed areas.
The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	No significant impact to the existing environment is predicted to occur.
The principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The Proposal will not threaten biological diversity or ecological integrity.
Principles relating to the improved valuation, pricing and incentive mechanisms a. Environmental factors should be included in the valuation of assets and services. b. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. c. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. d. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	The Proposal is not expected to generate any significant pollution or waste. Justification for the Proposal includes incentives to reduce environmental footprints and costs including: Promote economic activity in the locations which make up the cluster with Cockatoo Island Make best use of existing assets without substantial government funded capital upgrades Assist nearby mining operations through shared services and an expansion of service providers within the key Kimberley towns Centralise selected hi-tech services for Browse Basin oil and gas operators currently having to rely on subsea support from Asian ports and Darwin. Thereby reducing GHG emissions from these operators.
The principle of waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Construction and operation of the facility will not result in the generation of significant waste streams. Putrescible wastes will be disposed at the existing licenced landfill on the Island. There is also an existing metal dump for disposal of metal waste. Waste hydrocarbons will be removed from the Island for reprocessing. Wastes that cannot be disposed onsite will be transferred to the mainland by barge for disposal. Cut and fill volumes for the airstrip essentially balance. Any excess material, and some waste rock from existing mine dumps, will be used as fill for the wharf.

4.2 Identification of key environmental factors

Environmental factors are those parts of the environment that may be impacted by an aspect of a proposal. The EPA has 14 environmental factors, organised into five themes: Sea, Land, Water, Air and People.

The environmental factors are provided in Table 4.1 together with the EPA's objective for each factor. The relevance of each factor to the proposed Kimberley Supply Chain Cluster is discussed to identify which of the factors are Key Environmental Factors requiring further consideration.

Table 4.1 Identification of Key Environmental Factors

Factor	Objective	Relevance to Proposal	Key Environmental Factor?
Sea			
Benthic Communities and Habitat	To protect benthic communities and habitat so that biological diversity and ecological integrity are maintained.	Wharf construction has potential to impact benthic habitats.	Yes
Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	Wharf construction has potential to modify coastal processes.	Yes
Marine Environmental Quality	To maintain the quality of water, sediment and biota so that environmental values are protected.	Wharf construction has potential to cause sedimentation. Wharf operations will involve handling and storage of hydrocarbons.	Yes
Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.	Wharf construction and operations have potential to generate noise and result in vessel strikes.	Yes
Land			
Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	Construction will result in vegetation clearing.	Yes
Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	Distinctive landforms are not present. Construction will result in cut and fill to extend the airstrip.	No
Subterranean Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	Construction and operations will not result in any direct impact to subterranean fauna habitat. No new groundwater extraction. Indirect impacts (e.g. fuel spillage) managed through containment.	No
Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected.	No significant impact to environmental values expected.	Yes
Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	Construction will result in habitat clearing.	Yes
Water			
Hydrological Processes	To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.	No impact to any environmentally significant water dependent ecosystem. No new groundwater extraction. No permanent watercourses occur on the Island.	No
Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water so that environmental values are protected.	No inland waters occur on the Island.	No

Factor	Objective	Relevance to Proposal	Key Environmental Factor?
Air			
Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	No significant emissions are expected.	No
People			
Social Surroundings	To protect social surroundings from significant harm.	No social surroundings will be impacted.	Yes
Human Health	To protect human health from significant harm.	No human health impacts expected.	No

4.3 Key environmental factor - benthic communities and habitat

4.3.1 EPA objective

To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.

4.3.2 Policy and guidance

– Environmental Factor Guideline – Benthic Communities and Habitats (EPA 2016k)
– Technical Guidance – Protection of Benthic Communities and Habitats (EPA 2016l).

4.3.3 Receiving environment

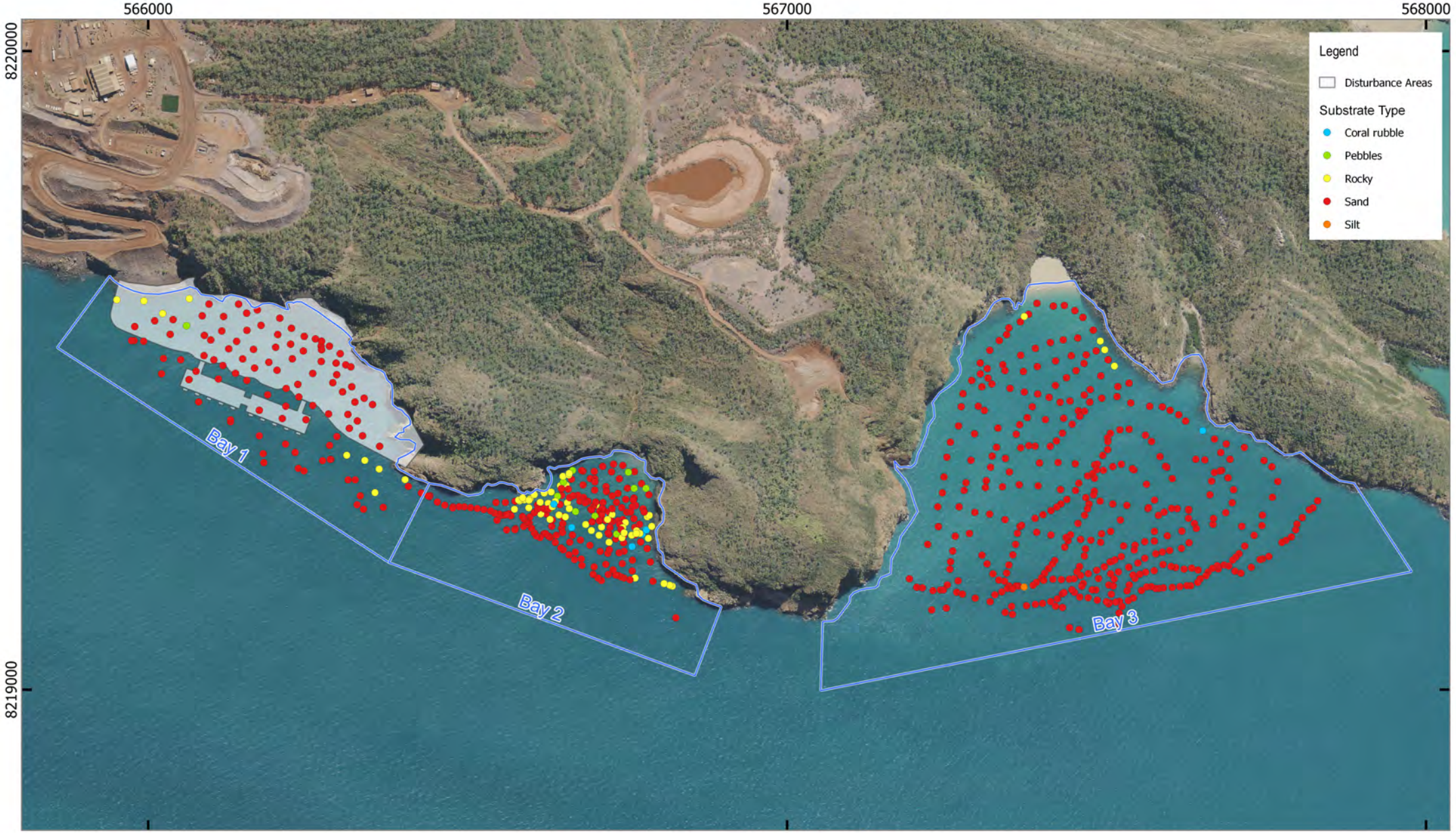
Baseline studies relevant to the Proposal are provided in Table 4.2.

Table 4.2 Baseline studies – benthic communities and habitat

Consultant	Survey Name
GHD (2025a) – Appendix A1	Kimberley Supply Chain Cluster Technical Study - Marine Flora and Fauna
GHD (2017b) – Appendix A2	Desktop BCH LAU Assessment and Bay 1 Visual Assessment
MScience (2011) – Appendix A3	Cockatoo Island Marine Closure Knowledge Base and Completion Criteria
MScience (2013) – Appendix A4	Cockatoo Island Barge Wharf Benthic Habitat Survey

The Cockatoo Island climate is a dry sub-tropical environment, in an area of low wave energy with a large tidal range of 10 m (MScience 2013). The large tidal range, steep cliffs and beach profile, and high ultraviolet radiation are the dominant factors that drive habitat distributions.

GHD (2025a) undertook a marine survey utilising digital drop camera video system to assess benthic habitats within the bay proposed for the wharf facility (Bay 1) along with the two adjacent bays to the south-east (Bay 2 and Bay 3, also known as Copper Bay) (Figure 4.1). The quality of habitat and occurrence of benthic communities to the north-west of Bay 1 has been compromised through mining-related operations (MScience 2011, 2013) and as such these areas were not surveyed.



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Map Projection: Mercator Auxillary Sphere
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GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Substrate Type

Project No. **12526793**
Revision No. **A**
Date. **30/11/2023**

FIGURE 4-1

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4.3.3.1 Marine substrate

The dominant substrate across the three bays was sand with fewer sites comprised of silt, gravel/pebbles, coral rubble and rocks (Table 4.3). All three bays had similar substrate patterns with rocky habitats around the shoreline and sandy bottoms in the centre, although Bay 2 had a considerably greater proportion of rocky substrate (21%) than the other two bays (1-8%). A breakdown of the seabed substrate and its spatial distribution is shown in Figure 4.1. A recent February 2025 MEQ survey (GHD, 2025c) confirmed that Bay 2 and Bay 3 were comprised primarily of gravel and sand.

Table 4.3 Substrate percentages within each of the three bays

Bay	Silt	Sand	Gravel/Pebbles	Coral Rubble	Rocky
Bay 1 (proposed wharf site)	0%	91%	1%	0%	8%
Bay 2	0%	71%	5%	3%	21%
Bay 3 (Copper Bay)	<1%	98%	0%	<1%	1%

4.3.3.2 Marine habitats

4.3.3.2.1 Overview

All three bays had similar physical attributes with gently sloping sandy beaches from the shore to approximately 0 mCD (approx. 0 mLAT). Because of the large tidal range, much of this sandy area is likely to be exposed or very shallow at low spring tides. These areas were very sparsely colonised by hard coral and macroalgae. Rocky environments were common in deeper waters around the headlands and were colonised only by turfing algae. As the depth increases, sandy habitats are more densely colonised by macroalgae and hard coral until approximately -5 mCD. Thereafter, the slope profile steeply descends to -20 mCD where generally only rippled sand was present with sparse hydroids and soft coral.

4.3.3.2.2 Bay 1 - Proposal Area

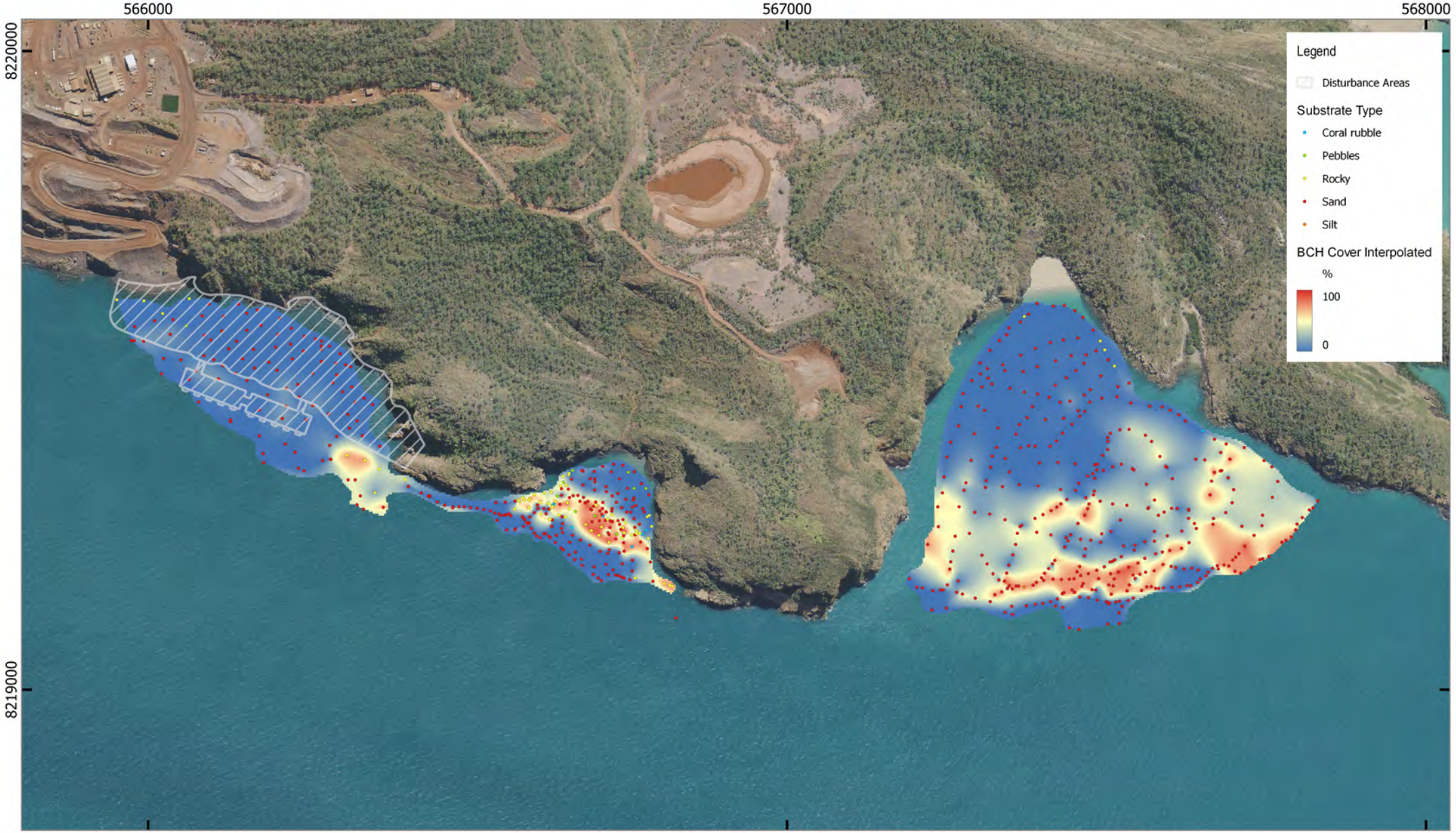
The survey area for Bay 1 was approximately 7.55 ha. Shallow (below 0 mCD) sandy habitats extended from the shoreline for approximately 120 m and steeply descended thereafter to -20 mCD. Of the 110 survey sites in this Bay, 67% were comprised of bare substrate (Table 4.4).

Table 4.4 Marine habitat types within Bay 1

Marine habitat types	Observations %	Marine habitat	Observations %
Bare	**67**	**Soft Coral**	**6**
Macroalgae	**21**		
Dense	0	Dense	0
Moderate	4	Moderate	0
Sparse	65	Sparse	89
Very Sparse	30	Very Sparse	0
Hard Coral	**15**	**Hydroids**	**8**
Dense	13	Dense	0
Moderate	13	Moderate	11
Sparse	19	Sparse	89
Very Sparse	56	Very Sparse	0

Note: Multiple marine habitat types were observed at some sites and therefore the cumulative percentages are >100%.

Macroalgae was observed at 21% of all sites with the majority comprised of very sparse to sparse coverage, and limited to shallower than -15 mCD (Figure 4.2). Macroalgae included *Caulerpa* spp. and *Chlorodesmis* spp.



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Map Projection: Mercator Auxillary Sphere
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Benthic communities and habitats

Project No. **12526793**
Revision No. **A**
Date. **30/11/2023**

FIGURE 4-2

Document Path:
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Hard coral occurred at 15% of sites primarily at the south-eastern edge of the bay (Figure 4.3). Hard coral coverage was moderate to dense. Several sites outside of this area had very sparse hard coral cover. Most sites with hard corals were shallower than -5 m to -10 mCD. Corals included foliose forms of *Turbinaria*, massive and sub-massive forms of *Porites*, branching *Acropora* and other corals from the families Acroporidae, Faviidae and Pocilloporidae.

Soft coral and hydroids were observed at only 6% of sites (Table 4.4).

Video stills of sites at key areas throughout Bay 1 are shown in Figure 4.4.

4.3.3.3 Adjacent bays

The survey area for Bay 2 was approximately 3.47 ha. Shallow sandy habitats extended from the shoreline to approximately 360 m with a band of hard coral prior to the steep drop-off. Of the 235 sites in Bay 2, 47% had bare substrate (Table 4.5).

Hard corals occurred at 43% of Bay 2 sites with the majority restricted to approximately a 50 m band width across the bay (Figure 4.3). Around 80% of coral sites had moderate to dense coverage. Corals included foliose forms of *Turbinaria*, massive and sub-massive forms of *Porites*, *Fungia*, branching *Acropora* and other corals from the families Acroporidae, Faviidae and Pocilloporidae.

Macroalgae were observed at 30% of Bay 2 sites. The majority of these sites had sparse coverage. Macroalgae included *Caulerpa* spp and *Chlorodesmis* spp.

Soft corals were observed at 1% of the Bay 2 sites.

Table 4.5 Marine habitat types within Bay 2

Marine habitat types	Observations %	Marine habitat	Observations %
Bare	**47**	**Soft Coral**	**1**
Macroalgae	**30**		
Dense	3	Dense	0
Moderate	11	Moderate	0
Sparse	66	Sparse	50
Very Sparse	20	Very Sparse	50
Hard Coral	**43**	**Hydroids**	**0**
Dense	46	Dense	0
Moderate	32	Moderate	0
Sparse	14	Sparse	0
Very Sparse	9	Very Sparse	0

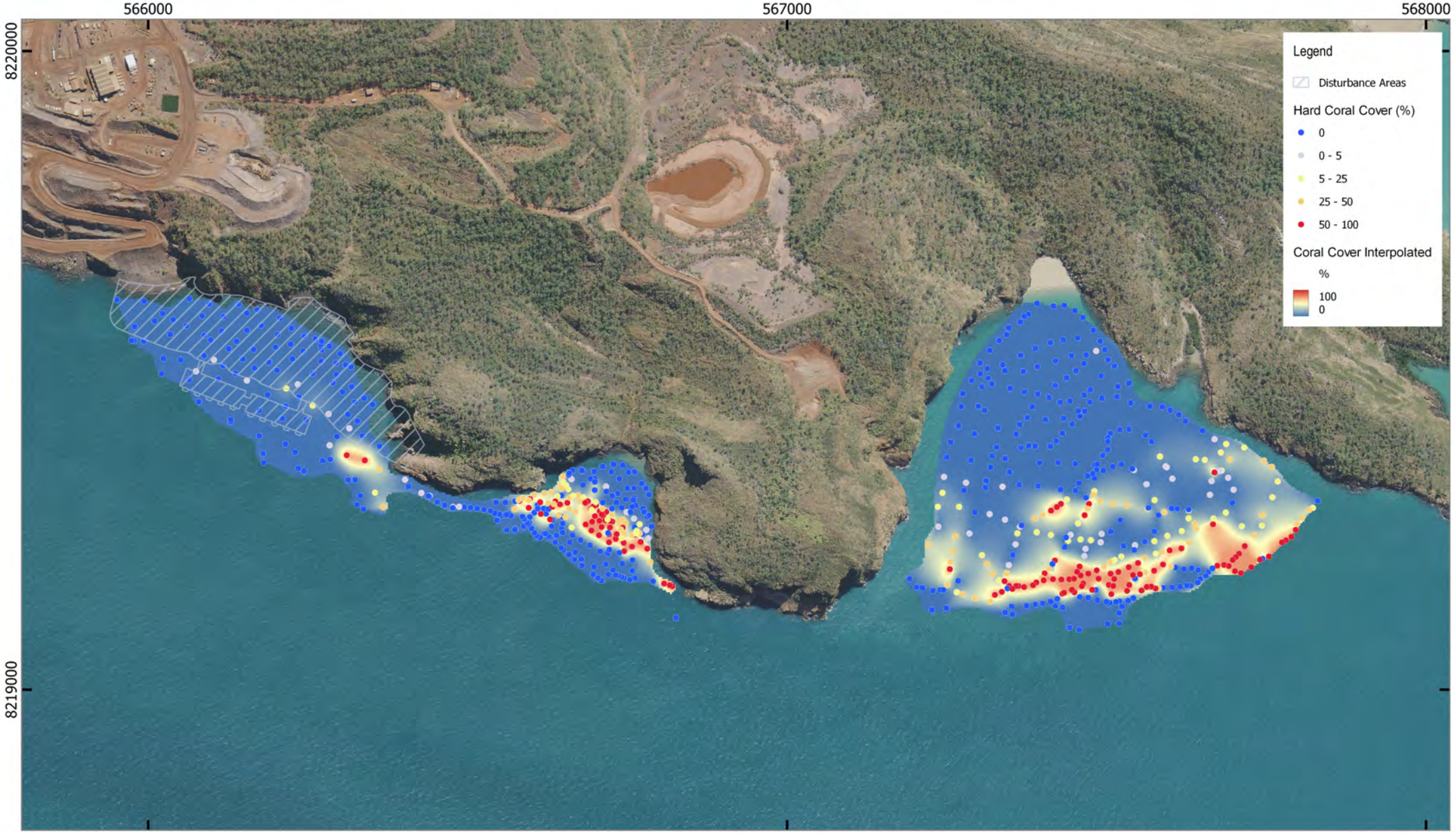
Note: Multiple marine habitat types were observed at some sites and therefore the total cumulative percentages are >100%.

The survey area for Bay 3 was approximately 19.64 ha. Shallow sandy habitats extend from the shoreline for approximately 400 m, and transition into a deeper band of hard coral before steeply descending the drop-off. Of the 378 sites in Bay 3, 38% had bare substrate (Table 4.6).

Hard corals were observed at 49% of Bay 3 sites with the majority of corals restricted to approximately a 50 m wide band across the bay (Table 4.3). Approximately 60% of all coral observations were moderate to dense coverage. Corals included foliose forms of *Turbinaria*, massive and sub-massive forms of *Porites*, *Fungia*, branching *Acropora* and other corals from the families Acroporidae, Faviidae and Pocilloporidae.

Macroalgae were observed at 36% of Bay 3 sites. The majority of these sites had sparse coverage. Macroalgae included *Caulerpa* spp and *Chlorodesmis* spp.

Soft corals and hydroids were observed at less than 2% the bay's sites.



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Cockatoo Island Multi-User Supply Base

Hard Coral Coverage

Project No. **12526793**
Revision No. **A**
Date. **03/12/2023**

FIGURE 4-3

Document Path:
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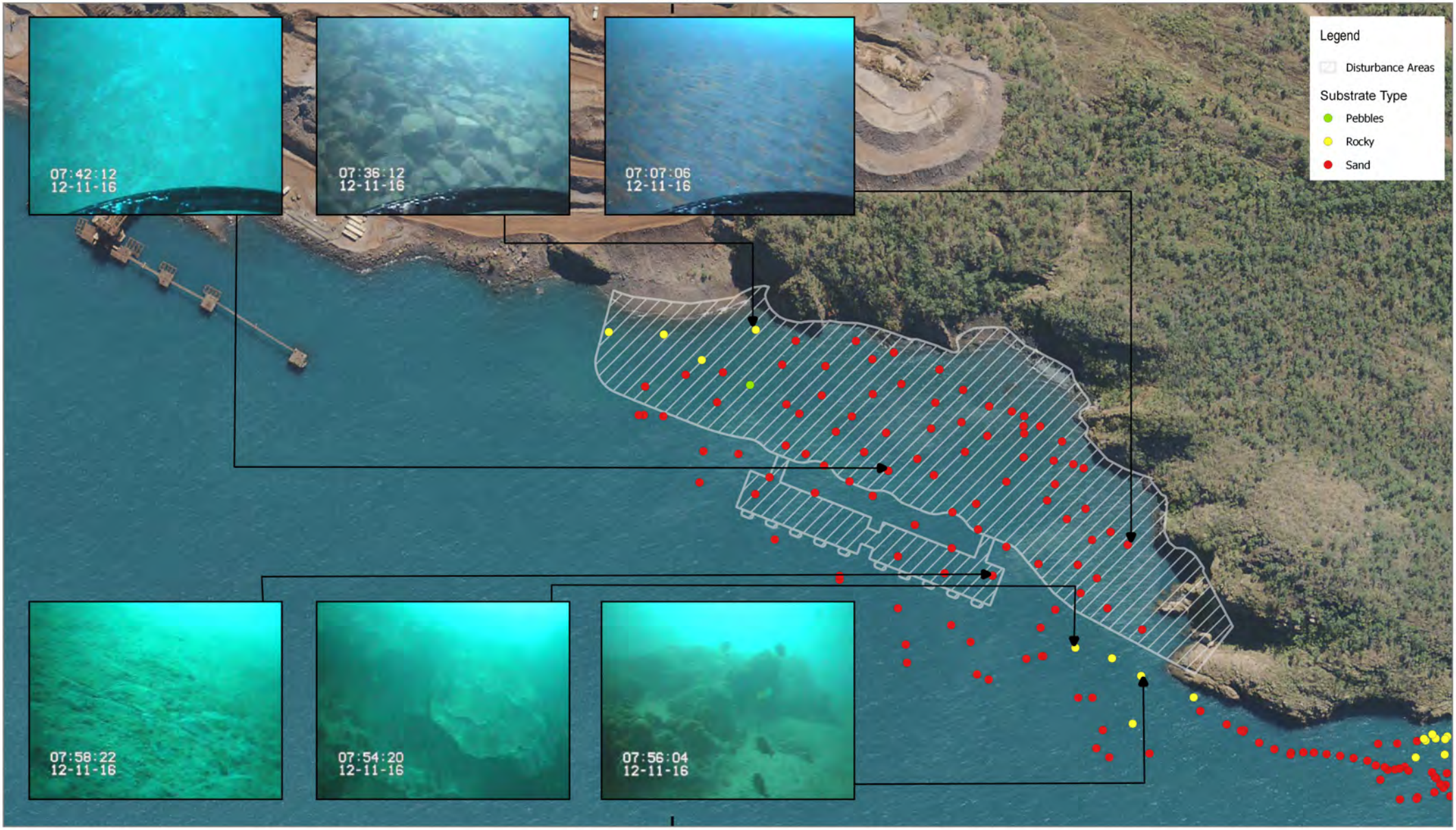

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Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Marine Habitat and Substrate Observations in Bay 1

Project No. **12526793**
Revision No. **A**
Date. **01/12/2023**

FIGURE 4-4

Document Path:
Print Date: 01 December 2023

Data Source:WANow
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Table 4.6 Marine habitat types within Bay 3 (Copper Bay)

Marine habitat type	Observations %	Marine habitat	Observations %
Bare	**38**	**Soft Coral**	**1**
Macroalgae	**36**		
Dense	1	Dense	0
Moderate	22	Moderate	0
Sparse	47	Sparse	25
Very Sparse	31	Very Sparse	75
Hard Coral	**49**	**Hydroids**	**<1**
Dense	41	Dense	0
Moderate	22	Moderate	0
Sparse	21	Sparse	100
Very Sparse	15	Very Sparse	0

Note: Multiple marine habitat types were observed at some sites and therefore the total cumulative percentages are >100%.

4.3.3.4 Comparison of bays

The survey identified that the estimated percentage of bare substrate in Bay 1 (67%) is substantially higher than in Bay 2 (47%) and Bay 3 (38%), likely due to Bay 1 having been impacted by nearby mining-related activities directly adjacent.

Soft coral and hydroids are relatively minor contributors to the benthic community assemblage, although they represent a greater proportion of Bay 1 than the other two bays.

The estimated hard coral area in Bay 1 of 0.2 ha is approximately 3% of this bay's surveyed area. The total estimated hard coral area of the three bays is 4.92 ha. Bay 1 therefore represents 4% of the total hard coral area across the three bays.

The estimated macroalgal area in Bay 1 of 0.19 ha is approximately 3% of this bay's surveyed area. This is a similar proportion to Bay 2 (5%) and Bay 3 (6%). The estimated macroalgae area in Bay 1 comprises 13% of the total macroalgae area across the three bays. Hence, a relatively small proportion (13%) of the total macroalgae area across the three bays will be at risk of impact by construction and operation activities of the proposed wharf facility.

4.3.3.5 Pile survey

An opportunistic survey was undertaken to assess the marine environment near to and on the piles of the ship loader. At the seafloor, sparse soft corals, macroalgae and hydroids were noted. Deeper sections of the piles were colonised by hydroids and macroalgae, and shallower (and likely intertidal) portions were heavily encrusted by bivalves.

4.3.3.6 Desktop BCH LAU Assessment

MScience (2007) previously defined an LAU to include Cockatoo, Irvine and Bathurst islands as shown in Figure 4.5, which is adopted here.

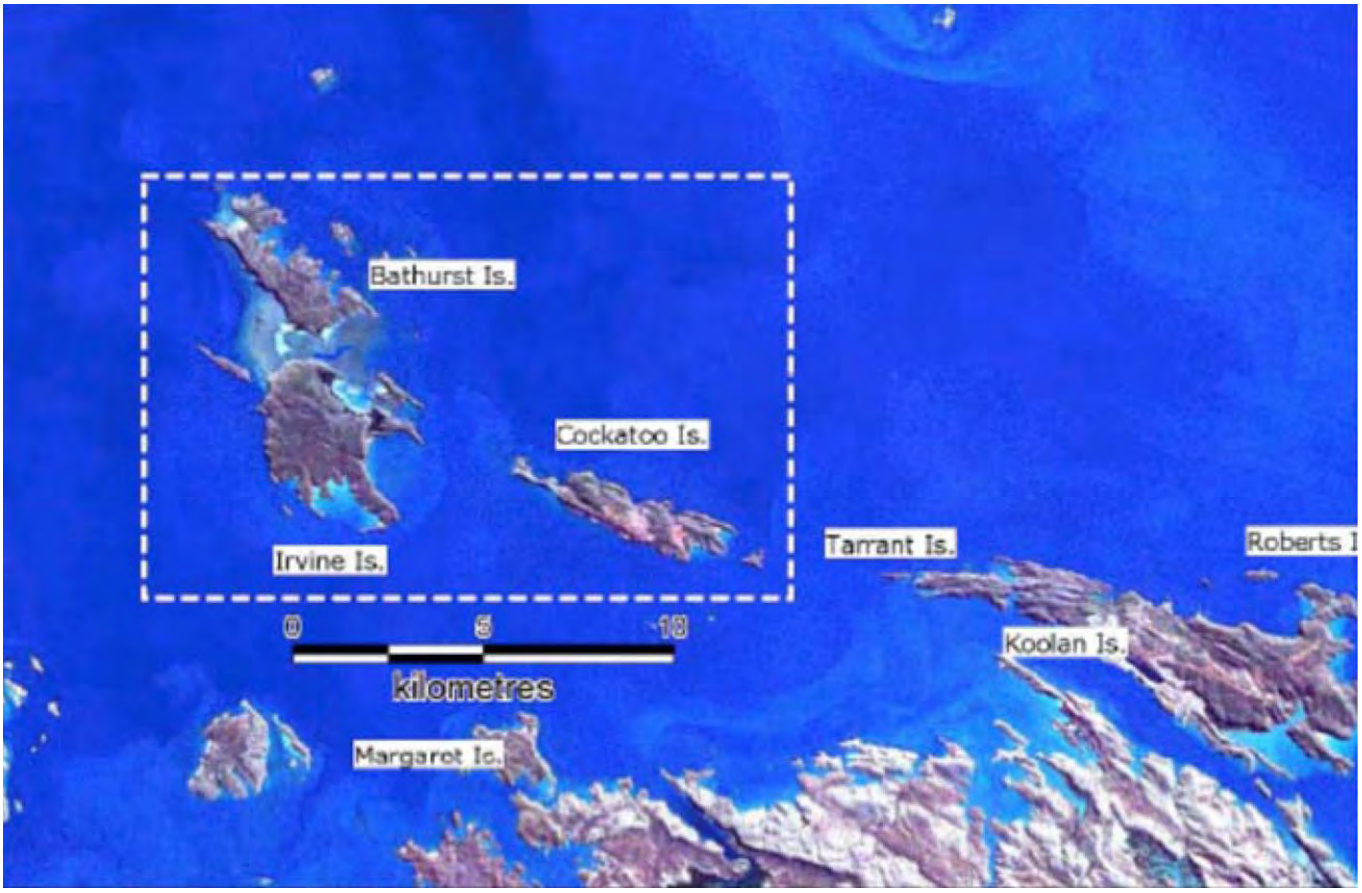


Figure 4.5 Spatial illustration of LAU from MScience (2007)

The selection of this LAU by MScience (2007) was on the basis of:

– Geomorphic similarity among the three islands in the LAU with substantial wide coral reef flats fringing the shorelines, as well as a narrow reef crest with adjacent slope areas. In contrast, Koolan Island generally only has coral growth along the narrow strips of the reef crest.
– Ecological continuity due to dispersal of coral larvae (and thereby gene flow) between coral populations of the adjacent islands in the LAU.
– Further, Cockatoo, Irvine and Bathurst islands have similar weather and water current climates, and are likely to be similarly affected by cyclones and bleaching events.

The nominated LAU has the following areal characteristics:

– Total area of ~200 km^2 of which ~40 km^2 is land.
– The area of Benthic Primary Producer Habitat (BPPH) (a subset of BCH) between the low tide mark and the 30 m depth contour is ~25 km^2.

MScience (2007) generated BPPH maps of Cockatoo Island, and Bathurst and Irvine islands and estimated the areas of two (2) BCH categories (coral and macroalgae) with a GIS-based methodology.

GHD (2025a) carried out surveys of the bay to be impacted by the proposed wharf development (Bay 1), and the two bays immediately to the east (Bay 2 and Bay 3) whereby:

– The benthic substrate was primarily comprised of sand in all three bays (Bays 1, 2 and 3 had 91%, 71% and 98% benthic areal cover, respectively) with elevated levels of rocky substrate in Bay 2 (Bays 1, 2 and 3 had 8%, 21% and 1% benthic areal cover, respectively).
– Most of the BCH in these three (3) bays is comprised of hard coral cover along the drop-off from the coastal shelves. There was low areal coverage of macroalgae on the coastal shelfs (particularly in Bay 3).

4.3.4 Potential impacts

4.3.4.1 Construction phase impacts

4.3.4.1.1 Direct loss of benthic communities and habitat

Construction of the wharf will result in the direct loss of approximately 5.75 ha of benthic habitat comprising:

– 5.21 ha of bare rock, sand or pebbles
– 0.54 ha of area with hard coral and algae.

This will include a loss of all sessile invertebrates and any motile fauna that do not move out of the area.

4.3.4.1.2 BCH Areal Estimates in LAU (Pre-European, Historic Loss, Proposed Development Losses)

GHD (2017b) BCH areal estimates of hard coral and macroalgae include:

– **Historic losses** (primarily from mining activities) have been estimated by MScience (2007) as:
  - Direct losses from the construction of the mine seawall occurred onto the adjacent reef flat. There is also evidence that a historic waste dump (from historical BHP mining-related activities) to the east of the wharf resulted in some reclaimed shoreline (part of Bay 1).
  - Indirect losses in proximity to the seawall occurred through modifications to the patterns of currents and sedimentation, and the effects of mine dewatering discharge. Further, sedimentation from the waste dump in Bay 1 has likely caused historic benthic habitat losses.
– **Pre-European habitation estimates** of macroalgae and hard coral in the LAU were estimated by adding historical loss estimates to the existing areal habitat estimates.
– **Proposed wharf development losses** are assumed to be 100% of the existing GHD (2025a) coral and macroalgae areas in Bay 1 from direct and/or indirect impacts from construction and operations.

The pre-European BCH area, historic losses and proposed wharf development losses are summarised in Table 4.7. On the basis of GHD (2017b) BCH surveys, only 0.03% and 0.06% of the existing hard coral and macroalgae areas, respectively, in the LAU are predicted to be lost to direct and/or indirect impacts from the proposed wharf development.

Table 4.7 BCH (hard coral and macroalgae) pre-European BCH areal estimates, and historic and proposed development areal and percentage loss estimates

BCH Type	MScience (2007)					GHD (2017b)	
	Pre-Euro Cockatoo (ha)	Pre-Euro Irvine & Bathurst (ha)	Pre- Euro LAU (ha)	Historic Losses for Cockatoo (ha)	% Historic Losses	Proposed Direct and Indirect Losses in Bay 1 (ha)	% Proposed Losses
Coral	65	969	1034	1.2	0.1%	0.3	0.03%
Macroalgae	54	369	423	3.5	0.8%	0.24	0.06%
Other	55	412	467	NA	NA	NA	NA
Total	174	1750	1923	NA	NA	NA	NA

4.3.4.1.3 Reduction in marine environmental quality

A temporary reduction in water quality during construction may occur during land reclamation caused by the placement of fill material. A reduction in water quality may occur through resuspension of fine material that could smother benthic habitats and increased turbidity that may reduce the light climate reaching photosynthetic organisms (i.e. macroalgae and hard coral).

During construction, a number of solid and liquid wastes will be generated on both land and any vessels, including sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils, and excess concrete and asphalt. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect BCH through localised toxic effects and reduction in water quality.

4.3.4.1.4 Introduction of invasive marine species

Vessels and marine equipment will be required during construction. Invasive marine species (IMS) can be carried by the vessel in ballast tanks, biofouling on the hull and internal systems, and in sediments collected around marine equipment. A successful translocation of an invasive marine species could out-compete the existing benthic communities.

4.3.4.2 Operational phase impacts

4.3.4.2.1 Loss of benthic communities and habitat

The floating wharf and any moored vessels at the wharf will reduce light reaching the seabed beneath. Any photosynthetic benthic communities such as hard coral or algae may be affected by the reduced light climate.

No anchoring of vessels within the DE during operations is anticipated, as vessels will moor alongside the floating wharf.

4.3.4.2.2 Gain of benthic communities and habitat

Based on observations of flora and fauna living on or around the existing ship loader piles, it is anticipated that a similar community assemblage will colonise the proposed wharf infrastructure. Further, colonisation of the wharf structure by hard corals may occur, particularly along the eastern portion of Bay 1 where some hard corals currently occur. As the majority of the subtidal environment is dominated by unconsolidated sediments, it is likely that these hard structures will be colonised quickly due to its limited availability in the wider area.

4.3.4.2.3 Reduction in marine environmental quality

A number of solid and liquid wastes will be generated during operations on the wharf and visiting vessels, and hazardous materials will be stored on the wharf. These include marine gas oil, sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils and cleaning fluids. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect benthic communities and habitats through localised toxic effects and reduction in water quality.

4.3.4.2.4 Introduction of invasive marine species

Operational vessels may carry IMS in ballast tanks, biofouling on the hull and internal systems, and in sediments collected around marine equipment. A successful translocation of an IMS could out-compete the existing benthic communities.

4.3.5 Assessment of impacts

The planned activities are unlikely to have a significant impact on benthic communities and habitats due to a number of factors, including:

– The expected very small loss of benthic primary producing habitat within the bay of 0.54 ha of hard coral and algae
– Adjacent bays have considerably greater benthic habitat of conservation value
– No dredging is required
– Fill material will likely be benign mine waste with low fine sediment content as per a preliminary indicative February 2025 survey of potential reclamation material (GHD 2025c). The 3D hydrodynamic modelling undertaken by GHD (2021) shows that excess suspended solids (SS) are not predicted to greatly alter the underwater light climate of benthic primary producers in Bay 2 and not at all for those of Bay 3 at the start of wharf construction as the distance of the construction turbidity source allows considerable settling and/or dispersion prior to transport to these locations. However, elevated excess SS is predicted to be sufficient to effect the underwater light climate in Bay 2 near the completion of the wharf as the construction turbidity source will be adjacent to this water body, though materially elevated SS (>3 mg/L above ambient levels) is only predicted for 1-5% of the time during construction periods. Further, minimal sedimentation or sedimentation rate impacts on BCH are predicted in Bays 2 or 3 at the start of wharf construction. However, towards the end of wharf construction when the turbidity source is closer to Bay 2 the GHD (2021)

sedimentation rate (>10 g/m^2/day) impact threshold is exceeded across much of Bay 2. Adverse impacts to larvae coral (settlement rates) occur at sedimentation rates as low as ~10 g/m^2/day (Tuttle & Donahue 2022) whereas the lowest mortality sedimentation rates in the published literature are ~100 g/m^2/day (Lock et al 2024). The maximum predicted sedimentation rates by GHD (2021) are <100 g/m^2/day at the westernmost extent of Bay 2 near the completion of construction of the easternmost extent of the reclamation area. Appendix A of EPA (2021) gives indicative SS concentrations for 'possible' and 'probable' effects in the Zone of Moderate Impact (ZoMI) on corals on the basis of running mean concentrations. GHD (2021) provides spatial distributions on the basis of percentiles of predicted construction-related SS concentrations. In the EPA (2021) possible and probable effect SS concentrations for running mean periods of 3 and 10 days for the ZoMI are compared to percentile predictions by GHD (2021) with several notable differences:

  - The GHD (2021) 95th and 80th percentiles over the 2 month simulation duration equate to predicted construction-related SS concentrations of 3 and 12 'cumulative' days, respectively. Clearly, the use of a percentile over the 2 months is much more conservative than the 'running mean' of 3 and 10 days of the indicative EPA (2021) SS thresholds for the ZoMI.[1]
  - The GHD (2021) SS concentrations noted in Table 4.8 are at the very westernmost extent of Bay 2 adjacent to the eastern extent of the wharf reclamation area for a simulation when only this portion of the proposed infrastructure is undergoing construction. This simulation predicts considerably higher and localised elevated SS levels at the very westernmost extent of Bay 2 relative to the remainder of Bay 2, and much less so for Bay 3. The evaluation in Table 4.8 of the predicted SS at the very westernmost extent of Bay 2 provides another layer conservatism on the potential effect of construction-related SS (turbidity) levels on corals.

– Even with these conservative evaluation measures, Table 4.8 shows that predicted SS concentrations in a very small area of the western extent of Bay 2 is estimated as ~50% and ~<30% of the EPA (2021) 'possible' and 'probable' thresholds for the ZoMI, respectively. On this basis, the risk of reversible mortality impacts (i.e. ZoMI) to corals from light limitation via elevated construction-related turbidity is predicted to be very low and limited to a very small extent of the very western portion of Bay 2, so turbidity plume monitoring is not considered necessary. Nonetheless, daily photographs from an elevated location during construction of the reclamation area are included in the monitoring program as a precautionary measure.
– The floating wharf and any operational vessels will be in deep waters and will not shade areas with benthic primary producers such as hard coral or algae
– Any accidental spillages or releases of wastes or discharges will quickly disperse due to the large tidal range and associated dilution rates of the area
– Additional habitats will become available for colonisation by marine flora and fauna.

Table 4.8 Evaluation of construction-related SS on possible and probable impacts for the ZoMI to corals at the westernmost extent of Bay 2

EPA (2021) Appendix A Coral Impact Thresholds in the ZoMI			Predicted TSS (GHD, 2021) @ Western Extent of Bay 2 (Proximal High Value Receptor) during Completion of Eastern Reclamation (Worst Case)				
Running Mean Period (Days)	**Possible Effect (mg SS/L)**	**Probable Effect (mg SS/L)**	**Percentile (Days)**	**Simulation Output Percentile**	**Predicted Construction-Related SS (mg/L)**	**Assumed Ambient SS (mg/)**	**Total Predicted SS (mg/)**
3	19.4	35.7	3	95th	7	3	10
10	13.1	20.9	12	80th	3	3	6

In short, construction-related turbidity and sedimentation may cause adverse effects on a limited spatial extent of Bay 2 adjacent to the easternmost extent of the proposed reclamation when this portion of the infrastructure is undergoing construction. However, hard coral mortality from construction-related turbidity and/or sedimentation is not predicted due to small fines flux from reclamation construction activities and high tides with associated rapid rates of transport and dilution.

[1] The GHD (2021) 95th percentile (~of 3 days (the 95th percentile) is more conservative because it is the 'maximum' predicted concentration of the 30 minute model outputs at

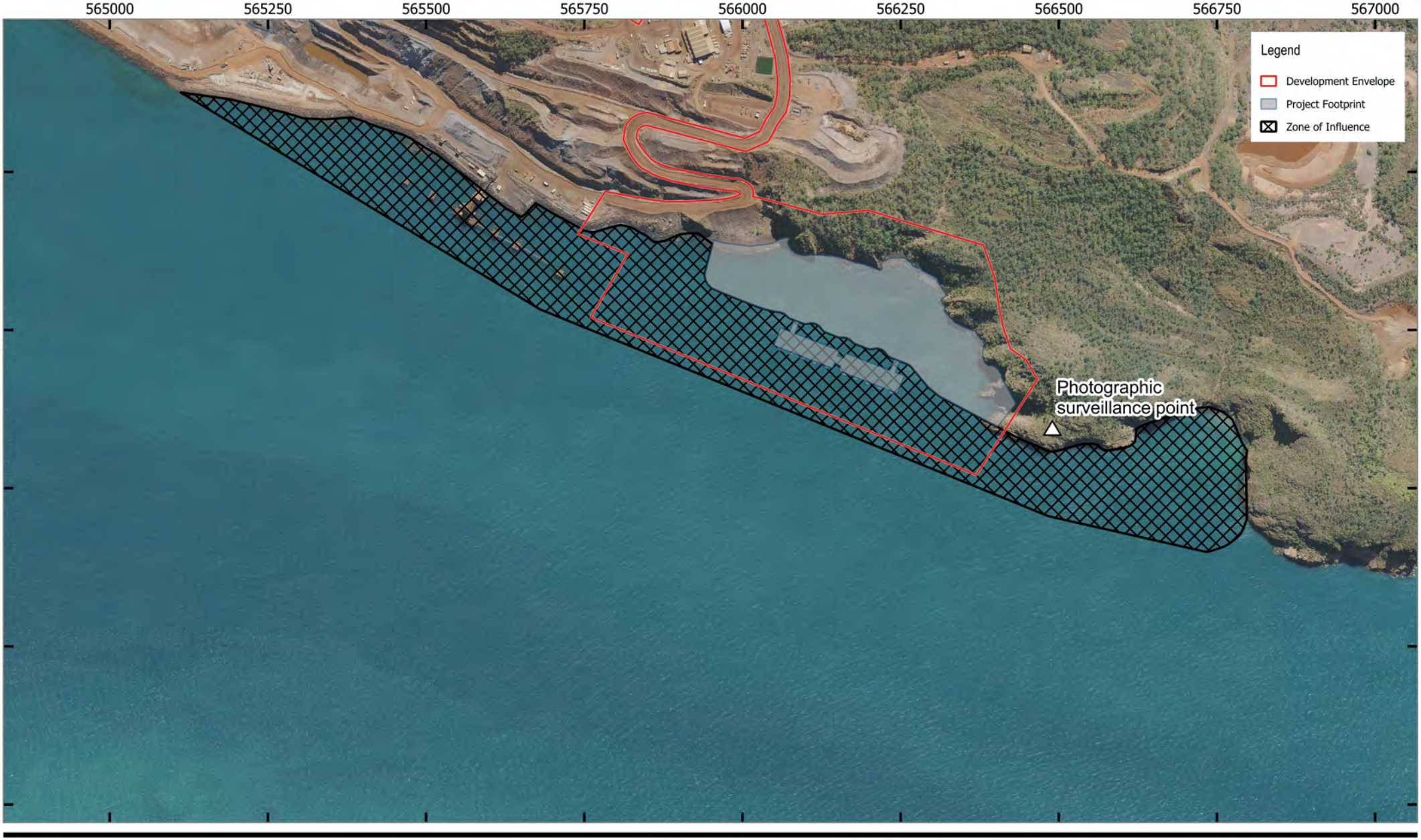
The effects of the warming climate on water temperatures are increasing the frequency and severity of coral bleaching events that may mask any small effect the wharf may have on BCH. It is therefore advisable that continuous water temperature measurements are carried out to understand the cause of any potential future effects on BCH (e.g. climate change, project effect).

4.3.6 Mitigation

Both a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) have been prepared to manage and mitigate potential impacts as a result of the construction on operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.9.

Table 4.9 Proposed mitigation measures for benthic communities and habitats

Potential Impact	Proposed mitigation		
	Avoid	**Minimise**	**Significant Residual Impact?**
Construction			
Direct loss of benthic communities and habitat	– Operational vessels will not typically anchor – The floating wharf structures are located in deep waters and will not shade areas with benthic primary producers such as hard coral or algae	– The zones of predicted BCH (i.e. hard corals and macroalgae) impact/effect are defined following EPA (2021) as follows: • The Zone of High Impact (ZoHI) comprises permanent irreversible direct losses under the reclamation footprint • There is no predicted Zone of Moderate Impact (ZoMI) for indirect reversible BCH losses as GHD (2021) simulated sedimentation rates are lower than the minimum published values of >100 g/m2/d (Lock et al 2024) for mortality of hard corals • The boundary of the Zone of Influence (ZoI) is defined on the basis of GHD (2021) sedimentation rates of >1 g/m2/d where potential adverse BCH effects may potentially occur as low as 10 g/m2/d (Tuttle & Donahue 2022). This zone is illustrated in in Figure 4.6 • Beyond the ZoI no effects from construction activities on turbidity and sedimentation are predicted. – Carry out pre-construction, post-construction and operational phase (once every 2 years) surveys of BCH in the two adjacent bays. If a decrease in hard coral cover or macroalgae is identified, then notify the EPA to implement appropriate management measures – Undertake continuous water temperature measurements to demine if potential coral bleaching event may occur. Should elevated temperature be recorded, undertake a risk assessment to determine if potential sedimentation may impact heat stressed corals, using the results of the below sediment plume observations. – During construction sub-daily photographs from a fixed elevated site will be used to document the intensity and spatial extent of the turbidity plume. If the plume extends for persistent periods into high value BCH regions (e.g. Bay 2) then management measures will be triggered to reduce the extent of the plume. Management measures to reduce/eliminate unacceptable turbid plume impacts include: • Additional layers of geotextile fabric within the reclamation area • Installation of silt curtains • Reduction in the rate of construction • Temporarily cease construction.	– No
Reduction in marine environmental quality	– Refer to Section 4.5.6 for management measures to mitigate/reduce MEQ contamination-related risks to BCH during construction		– No
Introduction of invasive marine species	– Refer to Section 4.6.6 for management measures to mitigate/reduce IMS risks to BCH during construction		– No
Operations			
Direct loss of benthic communities and habitat	– Operational vessels will not typically anchor with installation of permanent moorings to use when wharf at capacity – The floating wharf structures are located in deep waters and will not shade areas with benthic primary producers such as hard coral or algae	– Continuous measurements of water temperature to inform whether climatic effects on the region are the causal mechanism of potential future impacts to BCH – Spatial delineation of operational zones of moderate (MEPA) and high (HEPA) ecological protection areas is provided in Section 4.5.6 – Carry out operational phase surveys of BCH in the two adjacent bays every 2 years. If a material decrease in hard coral cover or macroalgae is identified in the HEPA, then notify the EPA to implement appropriate management measures.	– No
Reduction in marine environmental quality	– Refer to Section 4.5.6 for management measures to mitigate/reduce Marine Environmental Quality risks during operations		– No
Introduction of invasive marine species	– Refer to Section 4.6.6 for management measures to mitigate/reduce IMS risks during operations		– No



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

N

GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

ZoI during construction due to reclamation

Project No. **12526793**
Revision No. **A**
Date. **28/03/2025**

FIGURE 4-6

Document Path:
Print Date: 28 March 2025

Data Source:WANow
Created By: Tristan Sleigh

4.3.7 Predicted outcomes

The Project will result in the direct loss of 0.54 ha of hard coral and algae, of which 0.3 ha is largely very sparse hard coral. Species are represented in adjacent bays and in higher densities and coverage. Further, the indirect (from smothering by sedimentation and insufficient light from increased SS) losses of BCH are a very low percentage of the local regional spatial coverage (<0.1%). As this bay has sparse primary producer habitat compared to the adjacent bays, there is unlikely to be a significant impact to local biological diversity and ecological integrity, in addition, habitats will become available for colonisation by marine flora and fauna as a result of the implementation of the proposal.

4.4 Key environmental factor - coastal processes

4.4.1 EPA objective

To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.

4.4.2 Policy and guidance

– Environmental Factor Guideline – Coastal Processes (EPA 2016j).

4.4.3 Receiving environment

Baseline studies relevant to the Proposal are provided in Table 4.10.

Table 4.10 Baseline studies – coastal processes

Consultant	Study Name
M P Rogers and Associates PL [MRA] (2011) – Appendix A5	Cockatoo Island Seawall Decommissioning and Closure Plan
MScience (2011) – Appendix A3	Cockatoo Island Marine Closure Knowledge Base and Completion Criteria
GHD (2021) – Appendix A6	Kimberley Supply Chain Cluster EIA - Phase 2 - Marine Modelling of Coastal Processes and Construction Impacts

Tidal variations at Cockatoo Island are semi-diurnal and macrotidal, meaning two high and two low tides are typically experienced within a 24-hour period and that the difference between low and high tides are in excess of 10 m. Tidal planes are detailed in Table 4.11 for different vertical datums (MRA 2011).

The large variation in tidal levels, particularly during spring conditions, result in relatively high ambient current speeds around Cockatoo Island. Purcell (2002) indicated that tidal currents around 5 m/s can occur in the Buccaneer Archipelago.

Table 4.11 Local tidal planes

Tidal Plane	m CID[1]	m CD[2]	m AHD
Highest Astronomical Tide	+10.1	+10.9	+6.2
Mean High Water Spring	+9.1	+9.9	+5.2
Mean High Water Neap	+6.0	+6.8	+2.1
Mean Sea Level	+4.7	+5.5	+0.8
Mean Low Water Neap	+3.3	+4.1	-0.6

Tidal Plane	m CID[1]	m CD[2]	m AHD
Mean Low Water Spring	+0.2	+1.0	-3.7
Lowest Astronomical Tide (LAT)	-0.8	0.0	-4.7

1. CID (Cockatoo Island Datum) is approximately 0.8m above CD (Chart Datum) and 3.9m below AHD (Australian Height Datum)
2. CD is approximately LAT

The ambient wave climate of Yampi Sound and the Buccaneer Archipelago is very mild due to the protection from southerly and south westerly swells by the Dampier Peninsula (MScience 2011). The southern side of Cockatoo Island is further protected from wave energy due to short wave fetch and protection offered by other offshore Islands. The largest waves are experienced during cyclonic events, and are capable of creating damaging wave conditions (MScience 2011).

The wharf will be located in Bay 1 on the southern side of Cockatoo Island (Figure 4.1). The geomorphology of the bay is defined by steeply sloped rocky outcrops and characterised by intertidal and subtidal platforms typically between -2.0 mCD and 0 mCD (Figure 4.7). The seaward slope of the platform is steep and bed levels in the adjacent Yampi Sound reach -30 mCD to -40 mCD.

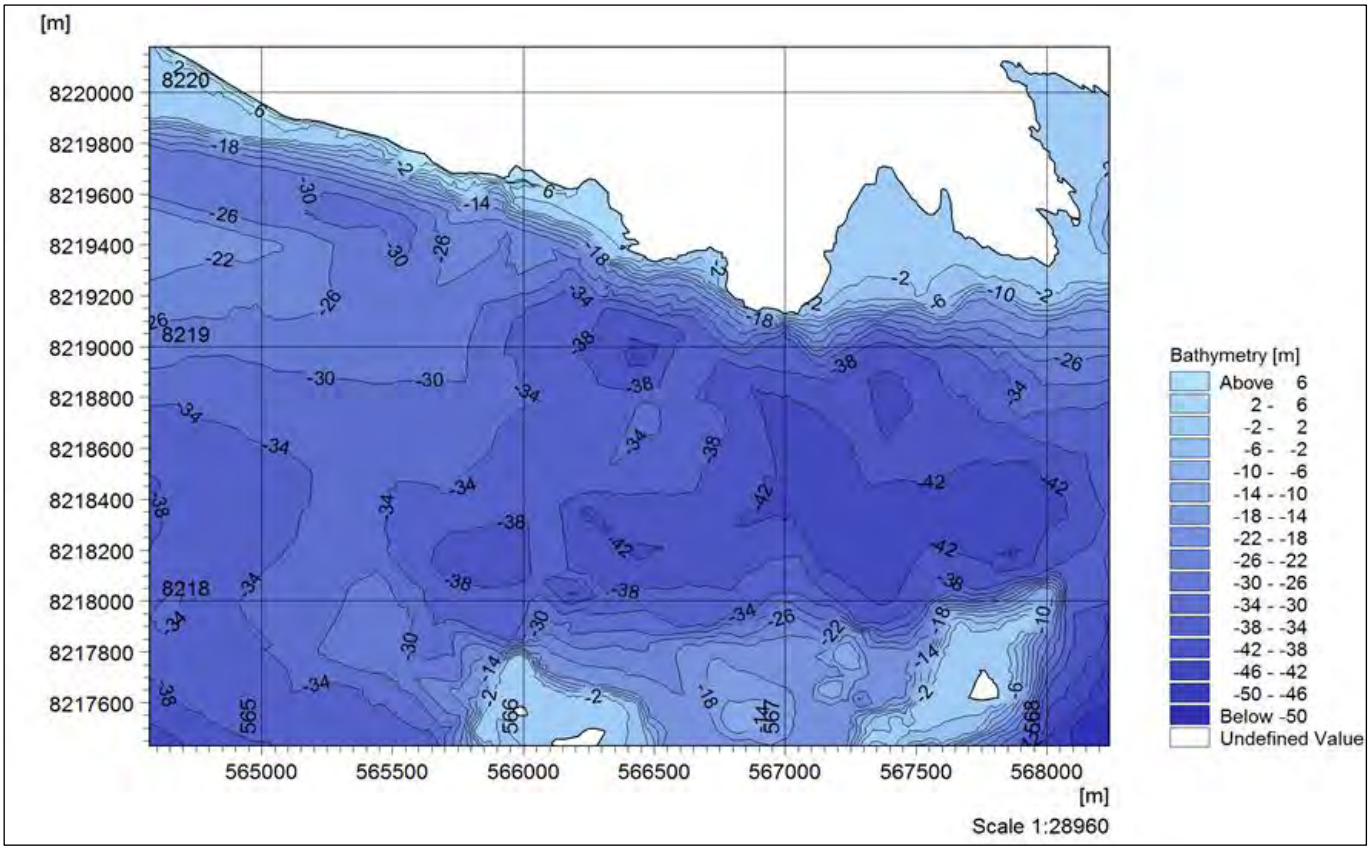


Figure 4.7 *Indicative bathymetry based on interpolation of data from C-MAP (Jeppensen Charts). Levels referenced to Chart Datum*

A small sandy beach occurs at the apex of Bay 1 (Figure 4.8). This was further supported by substrate assessment that indicates that Bay 1 has mainly a thin sandy substrate overlying a rock base (Figure 4.1).

Figure 4.8 Bay 2 site photograph

Sediment transport processes around Cockatoo Island are expected to be primarily driven by tidal currents due to the high tidal ranges and low ambient wave energy.

Evidence of current patterns in geomorphological features at Cockatoo Island is limited due to the lack of sediment and sedimentary landforms. The main sedimentary feature is the shallow subtidal and intertidal beach at the head of the bay as described above, which has formed from a combination of lithogenic and biogenic sediment sources.

4.4.4 Potential impacts

The wharf has the potential to locally alter current speeds and patterns that may impact:

– Patterns of erosion and accretion
– Benthic communities and habitats.

4.4.5 Assessment of impacts

The wharf will be constructed as a reclaimed retained, sealed hardstand. The wharf will be located adjacent to existing areas of steep rock within the bay and will run almost parallel to the shoreline. No dredging will be required.

The 3D hydrodynamic modelling undertaken by GHD (2021) assessed the potential effect of the wharf proposal on coastal processes. This study showed that predicted changes to currents will be localised, of low magnitude, and restricted to the vicinity of the proposed wharf. Hence, interruption of longshore currents or existing coastal processes is not predicted. Further, material changes to the water current climate experienced by BCH are not predicted.

The study also showed that bed shear stresses will be localised, of low magnitude, and restricted to the vicinity of the proposed wharf with no material change to areas of erosion and accretion. Further, material changes to the zones of accretion and erosion experienced by BCH are not predicted.

The steep hard shoreline of southern Cockatoo Island and lack of substantive beaches also precludes any material effects even if there were material changes to nearshore currents and/or zones of accretion and erosion, which are not predicted.

The wharf will not create tidally restricted bodies of water that are separated from Yampi Sound and consequently there will be no impact on coastal hydrodynamics as tidal current characteristics will not significantly change.

The land reclamation is likely to have only localised impacts and may result in some movement of sand and silts around the fill.

4.4.6 Mitigation

The design and location of the wharf removes the need for any additional mitigation as shown in Table 4.12.

Table 4.12 Proposed mitigation measures for coastal processes

Potential Impact	Proposed mitigation		
	Avoid	Minimise	Significant Residual Impact?
Changes to patterns of erosion and accretion	The wharf has been designed to avoid interruption of longshore currents or existing coastal processes.	n/a	No
Indirect loss of BCH	The wharf has been designed to avoid interruption of longshore currents or existing coastal processes so no loss to BCH will occur.	n/a	No

4.4.7 Predicted outcomes

The wharf will run parallel to the shoreline and will not significantly affect or interrupt longshore current movements or existing coastal processes.

Any residual impacts on sedimentation, geomorphology, current speeds and patterns will be localised and restricted to the vicinity of the wharf.

4.5 Key environmental factor - marine environmental quality

4.5.1 EPA objective

To maintain the quality of water, sediment and biota so that environmental values are protected.

4.5.2 Policy and guidance

– Environmental Factor Guideline – Marine Environmental Quality (MEQ) (EPA 2016h)
– Technical Guidance – Protecting the quality of Western Australia's marine environment (EPA 2016i).

4.5.3 Receiving environment

Baseline studies relevant to the Proposal are provided in Table 4.13.

Table 4.13 Baseline studies – marine environmental quality

Consultant	Study Name
GHD (2025b) – Appendix A13	Results of February 2025 Marine Environmental Quality Survey
GHD (2025c) – Appendix A14	Results of Preliminary Contaminant Survey of Reclamation Fill
MScience (2010) – Appendix A7	Cockatoo Island Marine Monitoring - Monitoring Survey Reports
GHD (2021) – Appendix A6	Kimberley Supply Chain Cluster EIA - Phase 2 - Marine Modelling of Coastal Processes and Construction Impacts

Marine environmental surveys have historically focussed on physical parameters of marine sediments and water in relation to the seawall activities. A summary of the available marine environmental quality information taken from 'baseline' sites and not related to historical impacts associated with seawall activities from MScience (2010) includes:

– Seawater
  - Total suspended solids ranging between 1 and 7 mg/L
  - Secchi depths ranging between 2.3 and 6.6 m.
– Marine sediments
  - Total iron content ranging between 1.46 to 7.13 mg/kg.

No known marine water quality investigations have been undertaken in the area of the proposed wharf, and sediment contaminant levels have not been investigated. However, the proximity of this area to the historical ship loader suggests that marine sediments may have elevated levels of iron, but otherwise be of high quality with low or absent contamination levels. Similarly, due to a lack of anthropogenic inputs since the cessation of mining activities in 2016 and large tidal regime, water quality is expected to be of high quality with low to pristine contamination levels. Turbidity (i.e. suspended solids) are known to be variable and influenced by large tides and seasonally high rainfall.

A February 2025 MEQ survey was undertaken to characterise the baseline marine water and sediment quality at a number of sites in the Proposal area (GHD, 2025a) where:

– Physico-chemical during neap tides documented well-mixed waters through at least 20 m of the water column with high dissolved oxygen and low turbidity levels.
– Non-organic analytes (e.g. metals/metalloids) in marine water were below the OEMP's Marine Environmental Quality Management Plan's (MEQMP) Environmental Quality Guidelines (EQG).
– Organics (e.g. BTEX, naphthalene) in marine water were below the laboratory Limits of Reporting (LoRs) and MEQMP EQG.
– The sediments at the Proposal site are comprised primarily of gravel and sand.
– Non-organic analytes (e.g. metals/metalloids, TBT) in marine sediments were below MEQMP EQG.
– Organics (e.g. TRH, TPH, TBT, BTEX, PAH) in marine sediments were below LoRs and MEQMP EQG.

The survey indicates that the marine waters and sediments at/near the Proposal site meet the MEQMP's EQG.

The dominant benthic habitat in the area of the wharf is unvegetated sandy substrate (67%) (GHD 2025a).

4.5.4 Potential impacts

Construction phase impacts

Reduction in marine environmental quality

A temporary reduction in water quality during construction may occur during placement of fill material. A reduction in water quality may occur through re-suspension of fine material that could smother benthic habitats, reducing the light climate reaching photosynthetic organisms. However, GHD (2021) simulations of construction-related impacts on the turbidity and sedimentation climate indicate that impacts will be minimal (see Section 4.3.5).

During construction, a number of solid and liquid wastes will be generated on both land and any vessels, including sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils, and excess concrete and asphalt. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect MEQ through localised toxicity effects and reduction in water and sediment quality.

Operational phase impacts

Hydrodynamic impacts from reclamation

Reclamation of the intertidal flat of Bay 1 has the potential to alter hydrodynamics and flushing, thereby potentially degrading MEQ in terms of water and sediment quality.

Reduction in marine environmental quality

A number of solid and liquid wastes will be generated during operations on the wharf and visiting vessels, and hazardous materials will be stored on the wharf. These include marine gas oil, sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils and cleaning fluids. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect benthic communities and habitats through localised toxic effects and reduction in water quality.

4.5.5 Assessment of impacts

The planned activities are unlikely to have a significant impact on MEQ due to a number of factors, including:

- No dredging is required for the wharf construction, thereby greatly reducing potential reductions in MEQ.
- Fill material will be largely benign mine waste with little fines material content. A preliminary analysis of the proposed fill material has shown contaminants of concern (CoC) within the material sampled were all below ANZECC 2000 Interim Sediment Quality Guidelines (ISQG). A detailed sampling and analysis program of the fines in the proposed fill material (i.e. material that may be released into the marine environment during construction) will be conducted to ensure it does not contain contaminant at levels that may pose a risk to the marine environment. This is outlined in the CEMP.
- Fluxes in total suspended solids are common in the wider area and are related to large tidal movements and seasonally high rainfall.
- GHD (2021) simulations with the proposed reclamation area predict minimal effect (impact) on the hydrodynamics, including Bays 1 and 2.
- Any accidental spillages or releases of wastes or discharges during construction and/or operations will quickly disperse due to the large tidal range and associated dilution rate of the area. Further, control measures will be in place to reduce the likelihood and severity of such releases (and spills) to the marine environment.

4.5.6 Mitigation

Both a Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) have been prepared to manage and mitigate potential MEQ impacts as a result of the construction on operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.14.

Table 4.14 Proposed mitigation measures for marine environmental quality

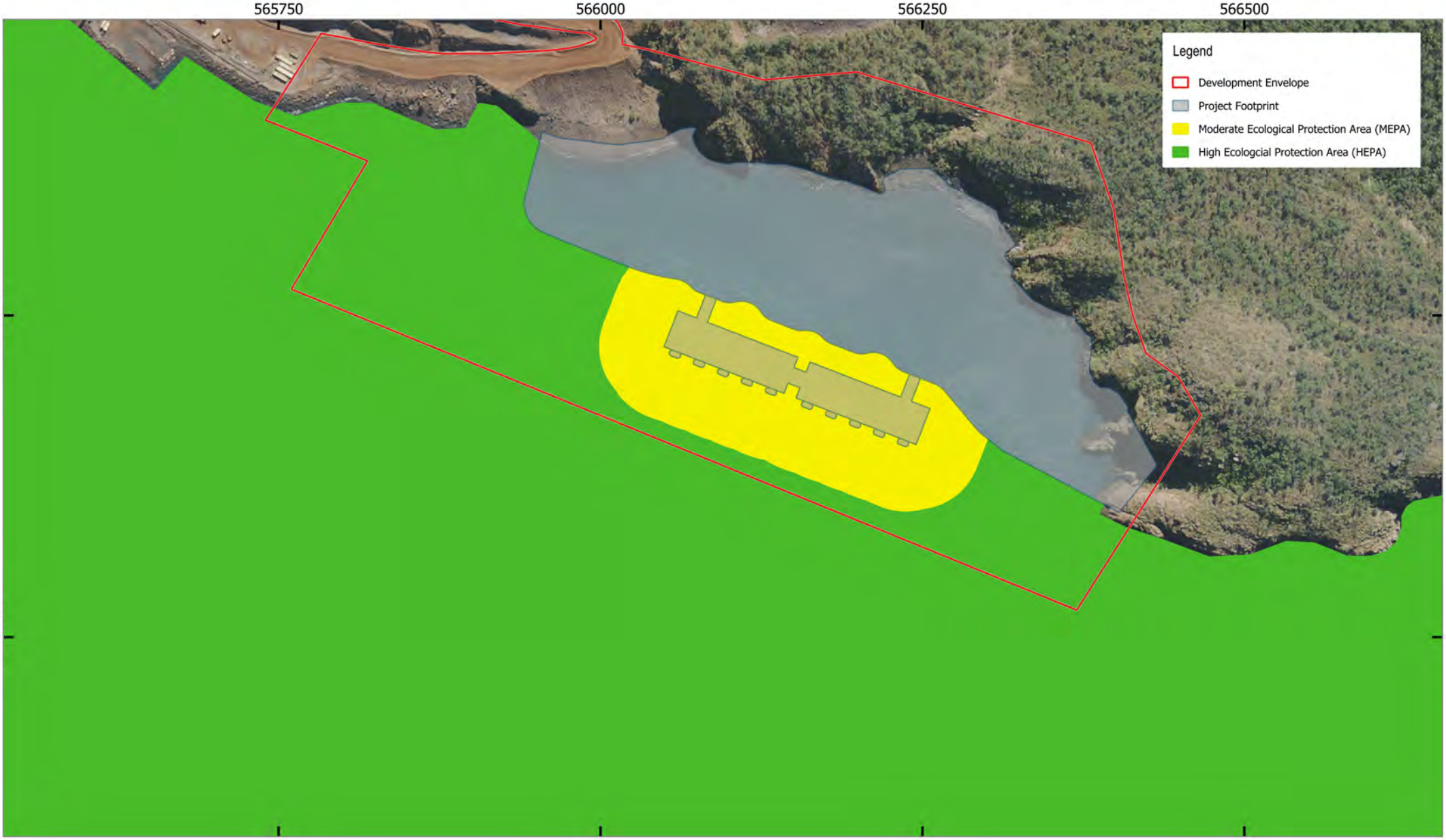
Potential Impact	Proposed mitigation		
	Avoid	**Minimise**	**Significant Residual Impact?**
Construction			
Reduction in marine environmental quality	– Pre-construction sampling and analysis of the fines of the reclamation fill material to confirm it is largely benign and inert, and it does not pose a material contamination risk to the marine environment.	– Progressive contaminant quality surveys and analysis of the fines in the reclamation material batches (volumes) prior to use in construction to confirm it is largely benign and inert, and it does not pose a material contamination risk to the marine environment. – During construction of the reclamation area visual photographic monitoring will be carried out to monitor potential turbidity impacts to BCH with management measures to reduce/eliminate unacceptable turbidity effects as described in Section 4.3.6. – Post-construction surveys of water quality (neap and/or slack tides) and sediment quality will be carried and compared to relevant MEPA and HEPA criteria (see below for definitions of MEPA and HEPA). Any exceedances relative to the pre-construction (baseline) survey may be from the effects of construction and reported to the EPA. – Construction vessels will: • Follow relevant Australian and international regulations, including MARPOL Marine Orders and Sewage Prevention Pollution Certificate. All hazardous materials will be stored with secondary containment, with continuous bunding or drip trays around machinery or equipment with the potential to leak hazardous materials • Have current MARPOL-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP – for noxious liquids) • Have Planned Maintenance System for equipment and machinery to avoid any unplanned discharges to the marine environment • No discharge of untreated sewage or unmacerated food wastes • A preference for, non-toxic chemicals will be used where available • Store all wastes on-board and transfer to the mainland for disposal at a licensed facility as per the construction vessel's Waste Management Plan • Have waste containers (bins etc.) for waste containment that are clearly marked and suitably covered to prevent material being blown overboard – Onshore waste management procedures during construction will be as those for the wharf during operations (see below). – Spill Contingency Plan (SCP) to manage spills in the marine environment that may occur during construction or operations	No
Operations			
Hydrodynamic impacts from reclamation		– Spatial delineation of operational zones of moderate (MEPA) and high (HEPA) ecological protection areas will be defined. The spatial extent of the MEPA will incorporate the floating wharf with a buffer of 50 m. Beyond the MEPA will be a HEPA classification. No low ecological protection area (LEPA) is established because no planned discharges are part of the proposal. The spatial representation of the MEPA and HEPA are illustrated in Figure 4.9. – During the operational phase the following will be carried out: • WQ monitoring will be carried out during slack neap tides twice per year (wet and dry seasons) and compared to relevant MEPA and HEPA criteria. Any exceedances will need to be demonstrated to occur naturally, or if due to operations then rectified to the satisfaction of the EPA. • Sediment quality monitoring will be carried out every two years and compared to relevant MEPA and HEPA criteria. Any exceedances, if due to operations will need to be managed to the satisfaction of the EPA.	No
Reduction in marine environmental quality		– Vessels during the operational phase will be subject to the same management measures as construction phase vessels. – Waste management procedures on the wharf during operations will include: • Waste containers on the wharf (bins etc.) will be clearly marked and suitably covered to prevent material being blown into the marine environment. Wastes will be appropriately disposed of on the Island or transferred to the mainland for disposal at a licenced facility • Hazardous materials stored on the wharf (e.g. marine gas oil, diesel, hydraulic fluids etc.) will be stored in self-bunded tanks or in drums within bunded and covered areas • Sewage will be transferred to the airfield septic tank system • Putrescible wastes will be disposed to the current licenced landfill • Waste hydrocarbons will be removed from the Island for reprocessing. Wastes that cannot be disposed onsite will be transferred to the mainland by barge for disposal. – SCP to manage spills in the marine environment that may occur during construction or operations.	No

4.5.7 Predicted outcomes

The Proposal does not involve dredging or any planned discharges and is not expected to interrupt longshore current movements or existing coastal processes.

Impacts will be largely confined to the construction phase and limited to the immediate area of construction that is largely dominated by unvegetated sandy environs.

There is not expected to be any significant risk to maintaining environmental values of the water, sediment and biota through the construction (other than direct impacts) or operational phases for which monitoring programs during construction and operational activities has been developed to demonstrate.



Paper Size ISO A4

0 25 50 75 100

Metres

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Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Ecological Protection Areas

Project No. **12526793**
Revision No. **A**
Date. **28/03/2025**

FIGURE 4-9

Document Path:
Print Date: 28 March 2025

Data Source:WANow
Created By: Tristan Sleigh

4.6 Key environmental factor - marine fauna

4.6.1 EPA objective

To protect marine fauna so that biological diversity and ecological integrity are maintained.

4.6.2 Policy and guidance

– Environmental Factor Guideline – Marine Fauna (EPA 2016g).

4.6.3 Receiving environment

Baseline studies relevant to the Proposal are provided in Table 4.15.

Table 4.15 Baseline studies – marine fauna

Consultant	Study Name
GHD (2025a) – Appendix A1	Kimberley Supply Chain Cluster. Technical Study - Marine Flora and Fauna

4.6.3.1 Marine mammals

Eleven species of protected or listed marine mammals may potentially occur within the Proposal area of which one species, the Humpback whale, is listed as Threatened under the EPBC Act (Table 4.16).

4.6.3.2 Fish

Thirty-three species of protected or listed fish may occur near the Proposal area, of which five species are listed as Threatened (Table 4.17).

4.6.3.3 Marine reptiles

Sixteen species of protected or listed marine reptiles potentially occur within the Proposal area, of which five species are listed as Threatened (Table 4.18). Conservation significant marine reptiles are described below.

Table 4.16 Conservation significant marine mammals

Common name	Scientific name	EPBC listing			BC Act listing/DBCA	Presence	
		Listed threatened	Listed migratory	Other matters	Listing		
Whales							
Bryde's whale	*Balaenoptera edeni*	-	✓	✓	M	Unlikely	Bryde's Whale is the second smallest of the baleen whales. They inhabit tropical and warm temperate waters and generally travel alone or in pairs. This species appears to be limited to the 200 m depth contour, moving along the coast in response to the availability of suitable prey, while the offshore form is found in deeper waters (500 to 1,000 m) (Best 1977). Because of its small population, lack of sightings and preference for deeper water, it is unlikely to be encountered in the Proposal area.
Humpback whale	*Megaptera novaeangliae*	-	✓	✓	CD M	Unlikely	Humpback whales occur throughout Australian waters with their distribution influenced by their migratory pathways and aggregation areas for resting, breeding and calving. The study area intersects with four humpback whale Biologically Important Areas (BIAs), for resting, nursing, calving and migration purposes. Humpbacks arrive in the coastal waters of the Kimberley after summer to breed and calve. These breeding activities are known to occur within waters surrounding the study area, however after the winter season has passed, Humpback whales are likely be in deeper waters outside of the study area as they return to the Antarctic. It is highly unlikely that the species would occur in close proximity to the DE, but it is likely that the species occur in deeper waters in vicinity of the Proposal area.
Killer whale	*Orcinus orca*	-	✓	✓	M	Unlikely	Killer Whales are thought to be the most cosmopolitan of all cetaceans in Australasian waters and have been sighted along the Kimberley coast (Kimberley Society 2010). Although not common, the Killer Whale may occur in waters surrounding the Proposal area. This species is not anticipated to occur within the DE given the inshore location.
Dolphins							

Common name	Scientific name	EPBC listing			BC Act listing/DBCA	Presence	
		Listed threatened	Listed migratory	Other matters	Listing		
Australian humpback dolphin	*Sousa sahulensis*	-	✓	✓	P4 M	Likely	The Australian humpback dolphin is a Migratory species known to inhabit the tropical and subtropical waters of Northern Australia. Although studies are limited, it is reported that the Australian humpback dolphins occur within 20 km from land in sheltered offshore waters near reefs and islands. The species is known to undertake breeding activities in waters surrounding Cockatoo Island and the entire Buccaneer Archipelago and as such is likely to occur within the Proposal area.
Australian snubfin dolphin	*Orcaella heinsohni*	-	✓	✓	P4 M	Unlikely	This dolphin is primarily found in nearshore habitats, but has been recorded up to 23 km offshore. Beagle Bay and Pender Bay are important areas for the Australian snubfin dolphin (DoE 2016a). The Australian snubfin dolphin is known to use the waters surrounding Cockatoo Island and the entire Buccaneer Archipelago for breeding. However, this species is not anticipated to occur within the Proposal area given its inshore location.
Bottlenose dolphin	*Tursiops truncates s. str.*	-		✓		Unlikely	Bottlenose dolphins are primarily known from coastal waters around the world, in the Indian Ocean, and in Australia in general, they tend to inhabit offshore waters. Therefore, the species is not anticipated to occur within the Proposal area given its inshore location.
Common dolphin	*Delphinus delphis*	-	-	✓	-	Unlikely	Common Dolphins are found in offshore waters. They have been recorded in waters off all Australian states and territories, but are rarely seen in northern Australian waters (Jefferson & Waerebeek; Ross 2006). Common Dolphins appear to occur in two main locations around Australia, with one cluster in the southern south-eastern Indian Ocean and another in the Tasman Sea. Therefore, it is unlikely that the species occur within the Proposal area.
Indian ocean bottlenose dolphin	*Tursiops aduncus*	-	✓	✓	M	Likely	In Australia, the Indian ocean bottlenose dolphin is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands. The species has been observed during surveys by Jenner and Jenner (2009) between Cape Leveque (north of Broome) and Scott Reef in June, July,

Common name	Scientific name	EPBC listing			BC Act listing/DBCA	Presence	
		Listed threatened	Listed migratory	Other matters	Listing		
							October and November 2008. It is likely that the species occurs within the Proposal area.
Risso's dolphin	*Grampus griseus*	-	-	✓	-	Unlikely	Risso's Dolphin have been recorded throughout most Australian waters (except Tasmania and Northern Territory) with no migratory patterns identified. The limited data available displays depth sightings of 180 m to 1500 m, with the only suspected resident population located near Fraser Island. The Risso's Dolphin may occur within the Proposal area, however it is unlikely given their depth preferences.
Pantropical spotted dolphin	*Stenella attenuata*	-	-	✓	M	Unlikely	Little is known about the distribution of the Spotted Dolphin in the Kimberley region, although they have been recorded at the shelf edge and shelf slope area of the Browse Basin in large, high energy, mixed schools in association with tuna, seabirds and other pelagic cetaceans. Small groups of Stenella species have also been observed resting in nearshore areas of coast on the lee side of bays (DSEWPaC 2012a). It is possible that the Spotted Dolphin may occur within the Proposal area, but due to depth preferences it is unlikely.
Sirenians							
Dugong	*Dugong dugon*	-	✓	✓	-	Possible	The dugong occurs in coastal and island waters from Shark Bay in Western Australia (25° S) across the northern coastline to Moreton Bay in Queensland (27° S) (DCCEEW, 2025). Regional sightings from 1996 to 2008 indicate some Dugong sightings around Cockatoo and Irvine Islands, but notably fewer than around the Dampier Peninsula, Derby, and Walcott Inlet (Holley and Prince, 2011). Given that Dugongs are largely associated with seagrass beds, they are unlikely to be found within the Proposal area, but are likely to be present in the wider coastal region.
'EN': Endangered. 'CD': Conservation dependant. 'VU': Vulnerable. 'SP': Specially protected. 'P1-P4': Priority 1 – 4. 'M': Migratory							

Table 4.17 Conservation significant fish

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed migratory	Other matters	Listing		
Sawfish							
Dwarf sawfish	*Pristis clavata*	VU	✓		P3	Unlikely	The distribution of Dwarf Sawfish is considered to be restricted to northern Australia, ranging from northern Queensland to the Pilbara coastline. Sawfish generally inhabit shallow coastal waters and estuaries, which are utilised as nurseries for juveniles. Surveys have found most captures of Dwarf Sawfish occur over soft sediment environments (DotE 2015). Given the known distribution of this species, it is unlikely that they would occur in the Proposal area.
Largetooth sawfish	*Pristis pristis*	VU	✓	✓	P3 M	Possible	The Indo-West Pacific subpopulation of the largetooth sawfish was formerly wide ranging from parts of the Western Indian Ocean through India and southeast Asia to New Guinea and Northern Australia. Its current distribution is now patchy across its range. In Australia, the species is distributed across freshwater rivers in the west and northern parts of Australia and can be found in coastal waters along the west and north coast. There is a BIA for reproduction south of the Proposal area. Due to the Proposal area's close proximity to key reproduction areas, the species may potentially occur in the Proposal area.
Green sawfish	*Pristis zijsron*	VU	✓	✓	VU	Possible	The green sawfish is distributed from about Mackay (Harry et al., 2011) in Queensland across Northern Australian waters to Shark Bay in Western Australia. Individuals have been recorded in inshore coastal environments and estuaries but the species does not penetrate into freshwater. There are also records of green sawfish hundreds of kilometres offshore in relatively deep water (Stevens et al., 2005). There is a BIA

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed migratory	Other matters	Listing		
							for reproduction south of the Proposal area and for foraging north of the Proposal area. Due to the Proposal area's close proximity to key reproduction and foraging areas suggests that the species may potentially occur in the Proposal area.
Narrow sawfish	*Anoxypristis cuspidata*	-	✓	✓	M	Possible	The Narrow Sawfish is now restricted to tropical eastern Arabian Seas, parts of Southeast Asia, Papua New Guinea and Australia. In Australia, it has a wide range and is found from Rockhampton (Queensland) to the Pilbara coast, commonly found in sheltered bays, river deltas, estuaries and sandy inshore waters (Kyne et al, 2021). Although there is limited information on this species distribution, there is a possibility that the species may occur within the Proposal area given its broad known distribution and preferred habitat.
Sharks							
Grey nurse shark	*Carcharias taurus*	VU	✓	✓	VU	Unlikely	The grey nurse shark is found globally in subtropical and temperate waters. In Australia, its distribution spans the coastal waters of New South Wales, southern Queensland, Western Australia, and southwestern Australia, extending to the northwest shelf (DCCEEW, 2021a). Given that their range is south of the northwest shelf, it is unlikely that this species is present within the Proposal area
Northern river shark	*Glyphis garricki*	EN	-	-	P1	Possible	The Northern river shark is known only from a small number of locations in Western Australia, the Northern Territory and Papua New Guinea, utilising rivers, tidal sections of large tropical estuarine systems and macrotidal embayments, as well as inshore and offshore marine habitats. Given its known distribution and preferred habitats, it

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed migratory	Other matters	Listing		
							is possible that the species may occur within the Proposal area.
Oceanic whitetip shark	*Carcharhinus longimanus*	-	✓	✓	-	Possible	The oceanic whitetip sharks is a large carcharhinid shark that occurs globally in all of the world's tropical and sub-tropical oceans (Forese and Pauly 2013). The species spends most of its time in the upper layer of the ocean, to a depth of 150 m and prefers off-shore, deep-ocean areas (Koopman and Knuckey 2014) Considering this species' preference for deeper ocean waters, it is unlikely that they would be found in the Proposal area. However, they might be present in the broader Proposal region or occasionally venture into shallower waters.
Scalloped hammerhead	*Sphyma lewini*	CD	-	-	-	Possible	The scalloped hammerhead is a coastal and semi-oceanic species with a circumglobal distribution in coastal warm-temperate and tropical seas. In Australia, the species is recorded around the northern coastline to approximately 34°S on both east and west coasts (Sydney, New South Wales (NSW) to Geographe Bay, Western Australia (WA) (Threatened species scientific committee 2024). In Northern Australia, juveniles inhabit shallow inshore environments whereas adults generally occur in deeper waters near the edge of the continental shelf (Threatened species scientific committee 2024). Based on the known distribution and habitat preferences of the species, there is a possibility that juvenile and occasional adult individuals may be found in inshore waters within the Proposal area. Additionally, the species might also be present in the broader coastal region.

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed migratory	Other matters	Listing		
Whale shark	*Rhincodon typus*	VU	✓	✓	M	Unlikely	Whale sharks are found in tropical and warm temperate seas between latitudes 30°N and 35°S, inhabiting both deep and shallow coastal waters, as well as lagoons of coral atolls and reefs. In Australia, they are prevalent at Ningaloo Marine Park, with sightings at Christmas Island, the Coral Sea, and as far south as Kalbarri and Eden. A recent study (D'Antonio et al., 2024) analysed satellite tracking data from 78 whale sharks tagged over 14 years, revealing that their distribution is far offshore from the Proposal area, with canyons and pinnacles along the continental shelf edge being the most utilised features for the species.
White shark	*Carcharodon carcharias*	VU	✓	✓	VU	Unlikely	The white shark is a large apex predator found in temperate and sub-tropical regions globally. In Australia, their range extends from southern Queensland to the North West Cape in Western Australia. A study by Bradford et al. (2020) using satellite tags over 15 years revealed that white sharks prefer southern waters and use off-shelf habitats more than previously thought. Therefore, it is unlikely that white sharks are present in or near the Proposal area.
Rays							
Giant manta ray	*Manta birostris*	-	✓	✓	M	Possible	The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and in productive coastal areas. In Australia it is recorded from south-western WA, around the tropical north of the country and south to the southern coast of New South Wales (NOAA Fisheries, 2024). Considering the limited data available on these species and their broad presence across all coastal waters in Australia, the

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed migratory	Other matters	Listing		
							species may be present in the Proposal area.
Reef manta ray	*Manta alfredi*	-	✓	✓	M	Possible	The reef manta ray is a large filter-feeding elasmobranch that is circumglobally distributed in tropical and subtropical waters. Although the knowledge on the movement patterns of reef manta rays is still sparse, the species is known to migrate relatively long distances, moving between productive areas, and aggregating at specific sites (Department of the Environment, 2012). Considering the limited data available on these species and their broad presence across all coastal waters in Australia, the species may be present in the Proposal area.
Other fish							
24 other species of pipefish and seahorse				✓	-	Possible	Twenty-four species of Syngnathids have been identified as potentially occurring in the study area. While their preferred habitat, seagrass, is likely to be sparse, these species are expected to inhabit shallow coastal areas. Therefore, it is possible for Syngnathids to be present in the Proposal area, albeit uncommonly.
Southern bluefin tuna	*Thunnus maccoyii*	-	-	-	-	Possible	The Southern bluefin tuna is a highly migratory species, and occur across the globe between 30-50°S. In Australia, the Southern bluefin tuna occurs from northern WA, across the southern region including Tasmania, and up into northern NSW. Juveniles are also known to inhabit nearshore waters in WA. Therefore, it is possible that they could occur in the Proposal area (DCCEEW, 2025b).
'EN': Endangered. 'CD': Conservation dependant. 'VU': Vulnerable. 'P1-P4': Priority 1 – 4. 'M': Migratory							

Table 4.18 Conservation significant marine reptiles

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed Migratory	Other matters	Listing		
Turtles							
Flatback turtle	*Natator depressus*	VU	✓	✓	VU M	Likely	The species has the smallest geographic range among the seven sea turtle species, restricted to tropical regions of the continental shelf and coastal waters of Northern Australia, Southern Indonesia, and Southern Papua New Guinea. Suitable nesting and foraging BIAs for flatback turtles are located south of the study area, making it possible for the species to occur within the study area (Department of Environment and Energy (DoEE), 2017). The Kimberley region is a significant nesting area, particularly on the Lacepede Islands. Studies from the 2009-2010 nesting season tracked several flatback turtles via satellite tags, revealing that individuals remained within 50 km of the Islands during the inter-nesting period. During post-nesting migration, turtles travelled from 17 km to up to 1,005 km, primarily staying within Western Australian waters, including Adele Island, Lacepede Island, and the Maret Islands (north-east of Derby). Migration pathways of flatback turtles nesting in southern rookeries, such as Port Hedland, generally pass the Dampier Peninsula to probable foraging grounds in the Kimberley region (RPS 2010). Given their known migration routes, nearby nesting sites and use of shallow benthic habitats for foraging, it is likely that flatback turtles occur within the Proposal area..
Green turtle	*Chelonia mydas*	VU	✓	✓	VU M	Likely	Green turtles are the most widespread and abundant turtle species in Western Australia waters, nesting from the Ningaloo coast to the Kimberley islands (Prince, 1994). In Australia, there are seven regional populations the species that nest in different areas: the southern Great Barrier Reef, the northern Great Barrier Reef, the Coral Sea, the Gulf of Carpentaria, WA's north-west shelf, the Ashmore and Cartier Reefs and Scott Reef (DoEE, 2017). Green turtles nesting along the WA coast migrate from feeding grounds in Western Australia, Indonesia, Northern Territory and Queensland (DCCEEW, 2021).

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed Migratory	Other matters	Listing		
							Desktop analysis of publicly available spatial data identified foraging BIAs for green turtles located south of the study area. Most green turtles that have been tracked from nesting beaches in the Ningaloo region by CSIRO to date have travelled to foraging grounds to the north (TurtleViewR, 2024). The study area is considered to be within the dispersal range of the North-West Shelf genetic stock (DoEE, 2017). Given their known migration routes, nearby nesting sites and use of shallow benthic habitats for foraging, it is likely that green turtles occur within the Proposal area.
Hawksbill turtle	*Eretmochelys imbricata*	VU	✓	✓	VU M	Likely	The species has a global distribution throughout tropical, sub-tropical and temperate waters, with nesting largely concentrated on sub-tropical beaches. Adults tend to forage in tropical tidal and sub-tidal coral and rock reef habitats where they primarily feed on sponges and algae (DoEE 2017). Key nesting and inter-nesting areas include the Dampier Archipelago, Barrow Island, Lowendal and Thevenard Islands, with areas of Ashmore Reef, Cartier Island and Sandy Island. Given this turtle's regional presence and use of reefs for foraging, it is likely that the Hawksbill turtle occurs in the Proposal area.
Leatherback turtle	*Dermochelys coriacea*	EN	✓	✓	VU M	Unlikely	The leatherback turtle has the broadest global distribution of any reptile, primarily nesting on tropical or subtropical beaches. Once found in every ocean except the Arctic and Antarctic, their population is now rapidly declining in many regions (NOAA Fisheries, 2024). In Australia, leatherback turtles inhabit tropical and temperate waters. They are most commonly reported feeding in coastal waters of central eastern Australia (from the Sunshine Coast in southern Queensland to central New South Wales), south-east Australia (including Tasmania, Victoria, and eastern South Australia), and south-western WA (DCCEEW, 2021). Although there are no major nesting areas recorded in Australia, there are scattered records in the NT, Queensland, and NSW (DoEE, 2017). No BIAs for foraging or reproduction have been identified within or near the Proposal area, and their migration ranges seem to occur far offshore.

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed Migratory	Other matters	Listing		
							Given the absence of significant feeding and nesting areas, it is unlikely that leatherback turtles are present in the Proposal area.
Loggerhead turtle	*Caretta caretta*	EN	✓	✓	EN M	Possible	The loggerhead turtle has a worldwide tropical and subtropical distribution. In Australia, they occur in tropical and warm temperate waters off the coast of Queensland, Northern Territory, WA, and New South Wales (DCCEEW, 2021). Nesting of loggerhead turtles is mainly concentrated on subtropical beaches, with major aggregations occurring to the north of the region, from Shark Bay to the Pilbara. Most loggerhead turtles that have been tracked from nesting beaches in the Ningaloo region by CSIRO to date have travelled to foraging grounds to the north (TurtleViewR; also see Pilcher et al 2021). Additionally, desktop analysis of publicly available information identified foraging BIAs of loggerhead turtles near the Proposal area. Given the known migration route and use of nearby shallow benthic habitats for foraging, it is possible that loggerhead turtles may occur within and adjacent to the Proposal area.
Olive Ridley turtle	*Lepidochelys olivacea*	EN	✓	✓	EN M	Unlikely	The Olive Ridley turtle nests throughout the globe in tropical waters withy migratory circuits through tropical and subtropical regions (Pritchard, 1969). The Australian breeding population is recorded as the largest breeding population remaining in the south-east Asia-western Pacific region (Limpus, 2008). Nesting has only been recorded in the NT and QLD throughout the Gulf of Carpentaria (DoEE, 2017). Additionally, no reproduction or foraging BIAs have been identified within or near the Proposal area. Given the absence of significant feeding and nesting areas, it is unlikely that Olive Ridley turtles are present in the Proposal area.
Crocodiles							
Freshwater crocodile	*Crocodylus johnstoni*	-	-	✓	SP	Unlikely	Freshwater crocodiles occur along all but the near coastal reaches of the rivers, streams and creeks that flow into the waters off Northern Australia between King Sound in the south-western Kimberley, Western Australia and the northern part of Cape York Peninsula, Queensland (Australian Museum, 2025).

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed Migratory	Other matters	Listing		
							Despite the common name, freshwater crocodiles may also occur in brackish waters up to 24% salinity (seawater is 35%) (Australian Museum, 2025). Given the salinity concentration in the Proposal area, it is unlikely that the species is present there.
Saltwater crocodile	*Crocodylus porosus*	-	✓	✓	SP M	Likely	Saltwater crocodiles is found in Australian coastal waters, estuaries, lakes, inland swamps and marshes. Despite the species' common name, the salt-water crocodile can persist in freshwater bodies. The species' distribution ranges from Rockhampton in Queensland throughout coastal Northern Territory to King Sound (near Broome) in Western Australia. Anecdotal observations from Cockatoo Island confirm that saltwater crocodiles occur infrequently within and near the Proposal area.
Monitors							
Mertens water monitor	*Varanus mertensi*	EN	-	-	-	Possible	The Mertens water monitor occurs patchily across tropical northern Australia, from the west Kimberley in Western Australia across the Top End of the Northern Territory (NT), to the wet tropics in far north Queensland (Qld). The study by Woinarski and Palmer (2013) involved extensive island surveys, detecting Mertens' water monitor on 1 out of 24 islands off the Kimberley coast and on 10 out of more than 66 islands surveyed off the Kimberley and Northern Territory coastlines. These islands represented less than 1% of the modelled distribution of Mertens' water monitor. However, given the species' distribution and potential presence on islands, it is possible that the species occurs within the Proposal area.
Mitchell's water monitor	*Varanus mitchelli*	CE	-	-	-	Unlikely	The Mitchell's water monitor occurring across the wet-dry tropics of northern Australia from Yampi Sound Training Area in the far west Kimberley of Western Australia across the Kimberley and Top End of the Northern Territory to approximately the Boodjamulla National Park area of far northwest Queensland. However, Mitchell's water monitor is not known to occur on any offshore island: general fauna surveys of more than 66 islands across the Kimberley region and the Wessel, English and Tiwi Island groups in the Northern Territory have not detected it (DCCEEW, 2023).

Common Name	Scientific Name	EPBC Listing			BC Act/DBCA Listing	Presence	
		Listed Threatened	Listed Migratory	Other matters	Listing		
							Therefore, the species is unlikely to occur within the Proposal area
Sea snakes							
15 sea snake species including **one** Critically Endangered species (Leaf scaled sea snake)	*Aipysurus foliosquama*	CE	-	✓	-	Unlikely (leaf scaled sea snake) Possible (other species)	The species is known to inhabit shallow waters (less than 10 m deep), particularly in protected areas of the reef flat, adjacent to living coral, and on coral substrates. It is found exclusively on the reefs of the Sahul Shelf in Western Australia, especially on Ashmore and Hibernia Reefs in the North-west Bioregion (DCCEEW, 2025d). Therefore, it is unlikely that the species occur in the Proposal area. There is a potential that other sea snake species occur within the Proposal area (e.g. the widely distributed sea snakes).
'CE': Critically Endangered. 'EN': Endangered. 'VU': Vulnerable. 'SP': Specially protected.							

4.6.4 Potential impacts

4.6.4.1 Construction phase impacts

4.6.4.1.1 Direct loss of benthic communities, habitat and waters

Construction of the wharf will result in the direct loss of approximately 5.75 ha of benthic habitat comprising:

– 5.21 ha of bare rock, sand or pebbles
– 0.54 ha of area with hard coral and macroalgae.

This area also includes the subtidal and intertidal waters above the benthic communities.

These habitats may support marine fauna that use the habitats as food sources, refugia, spawning and nursery grounds.

4.6.4.1.2 Noise

During construction, underwater noise will be generated by vessel operations and rock dumping (during land reclamation). Underwater noise generated by rock dumping activities is mainly as a result of the splash, tumble and grinding of rocks during the placement process. Generally, noise from one rock placement event has a slow signal rise time and then reaches its peak level, then followed by a slow drop in levels. Placement activities can be regarded as a sporadic occurrence classified as a non-pulse, transient noise type.

The non-impulsive noise criteria for physiological impacts for species relevant to the area of interest are summarised in Table 4.19.

Table 4.19 Key physiological noise criteria for marine fauna identified within study area

Type of animal	Functional hearing groups[1]	Noise criteria (Non impulsive noise), PTS[2]	Noise criteria (Non-impulsive noise), TTS[3]
Marine mammals	Low-frequency cetaceans (LF)	199 SEL Weighted (LF)	179 SEL Weighted (LF)
	High-frequency cetaceans (HF)	198 SEL Weighted (HF)	178 SEL Weighted (HF)
	Sirenians (SI)	206 SEL Weighted (SI)	186 SEL Weighted (SI)
Sea turtles	Sea turtle	220 dB SEL_{cum}	200 dB SEL_{cum}
Fishes	Fish (no swim bladder)	Low risk	Low risk
	Fish (swim bladder not involved in hearing)	Low risk	Low risk
	Fish (swim bladder involved in hearing)	170 rms (48h)	158 rms (12h)

Note 1: The peak and rms noise criteria are in units dB re: 1 µPa. The Sound exposure level (SEL) noise criteria are in units dB re: 1 μPa^2s and correspond to cumulative noise impacts, conservatively calculated over a 24-hour time period.
Note 2: Mortality or permanent injury.
Note 3: Temporary loss of hearing sensitivity.

Modelling

GHD (2025d) undertook an underwater noise impact assessment to determine the effects of underwater noise from the construction activities in terms of physical injury, impairment to hearing, or behavioural disturbance it might cause to marine megafauna species in the proposed Project area and its immediate surrounds (Appendix A).

Underwater noise modelling was considered for two primary underwater noise generating sources from this project:

– Dumping of rocks from truck into water
– Relocation of dumped material using land-based excavator

Source Levels (SLs) used as the basis of the noise modelling have been sourced from historical underwater noise measurements of similar activities. Details of the noise measurement reference, measurement conditions and Sound Exposure Levels (SEL) at 1 metre are summarised in Table 4.20.

Table 4.20 Noise modelling scenarios

Scenario	Activity	Operating period	Measurement details	Source level at 1 metre, dB re uPa	Reference
S1	Rock dumping from truck into water	12 min / hour	Rock-wall construction for Townsville Marine Precinct, depth 2-4m	179	(GHD, 2021)
S2	Relocation of dumped material using land-based excavator	40 min / hour	Dredge bottom impact and excavation noise from backhoe dredger, New York	179	(Reine & Dickerson, 2014)

The following assumptions have been made regarding the operating period of each noise source:

– Assumed 1 truck would dump material every 5 minutes and it would take approximately 1 minute to unload material resulting in 12 minutes of dumping in every hour of operation
– Assumed relocation would occur during the periods when rock dumping is not occurring for up to 40 minutes of excavating activities in every hour of operation.

Detailed underwater noise modelling was undertaken using RAMGeo (parabolic equation solver used for low-frequencies) and Bellhop (ray tracing solver used for high-frequencies). The modelling was used to calculate the estimated range to the relevant physiological impact noise exposure thresholds for each of the two modelled activities. More detailed modelling methods are described in the Underwater Noise Impact Assessment report (GHD 2024d; Appendix A).

Impacts

Marine Mammals

Based on the modelling results and relevant species of interest, distances to the physiological noise exposure onset criteria ($SEL_{24hr,}$ dB re 1 $\mu Pa^2 \cdot s$) were calculated for the following functional hearing groups:

– Low-frequency cetaceans (LF)
– High-frequency cetaceans (HF)
– Sirenians (SI).

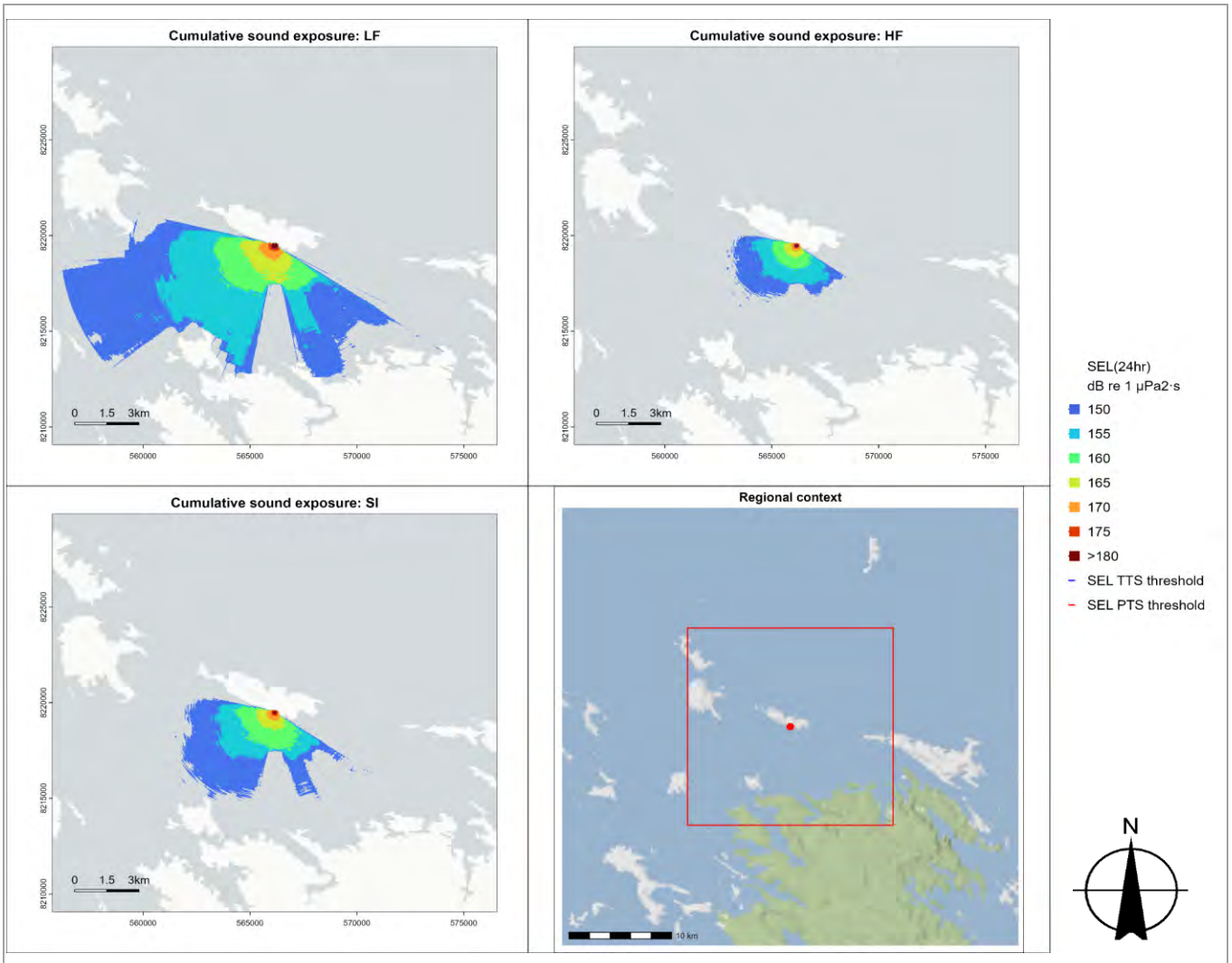
SEL_{24hr} is a cumulative metric that represents the effect of noise within the operational period based on the assumption that an animal is continuously exposed to operational noise at a stationary position. This is considered an unlikely worst-case scenario since, more realistically, marine animals would not stay in the same location or at the same distance from a sound source for an extended period of time. Given this, the estimated range to an exceedance of the SEL_{24h} criteria does not mean that any animal travelling within this radius from the source *will* be injured, but rather that it *could* be injured if it remained within that range for the entire duration of the construction activity.

The results are based on an animal's noise exposure to rock dumping and rock placement activities assuming three activity durations (12hr, 10hr and 8hr) within that 24-hour period. The estimated range at which a permanent threshold shift (PTS) and temporary threshold shift (TTS) could occur is based on the 95th percentile distance from the source at which the criteria is exceeded.

The R95% distances to the physiological noise exposure onset criteria (PTS and TTS) are shown in Table 4.21 and Figure 4.10 and Figure 4.11. The PTS thresholds for low frequency cetaceans are predicted to be met up to 10 meters from the source for any operating period and are not met for other mammals. The distance to the TTS thresholds are greatest for low frequency cetaceans during a 12 hour working period and are met up to 430 metres from the source.

Table 4.21 R95% distance to PTS and TTS threshold levels, metres

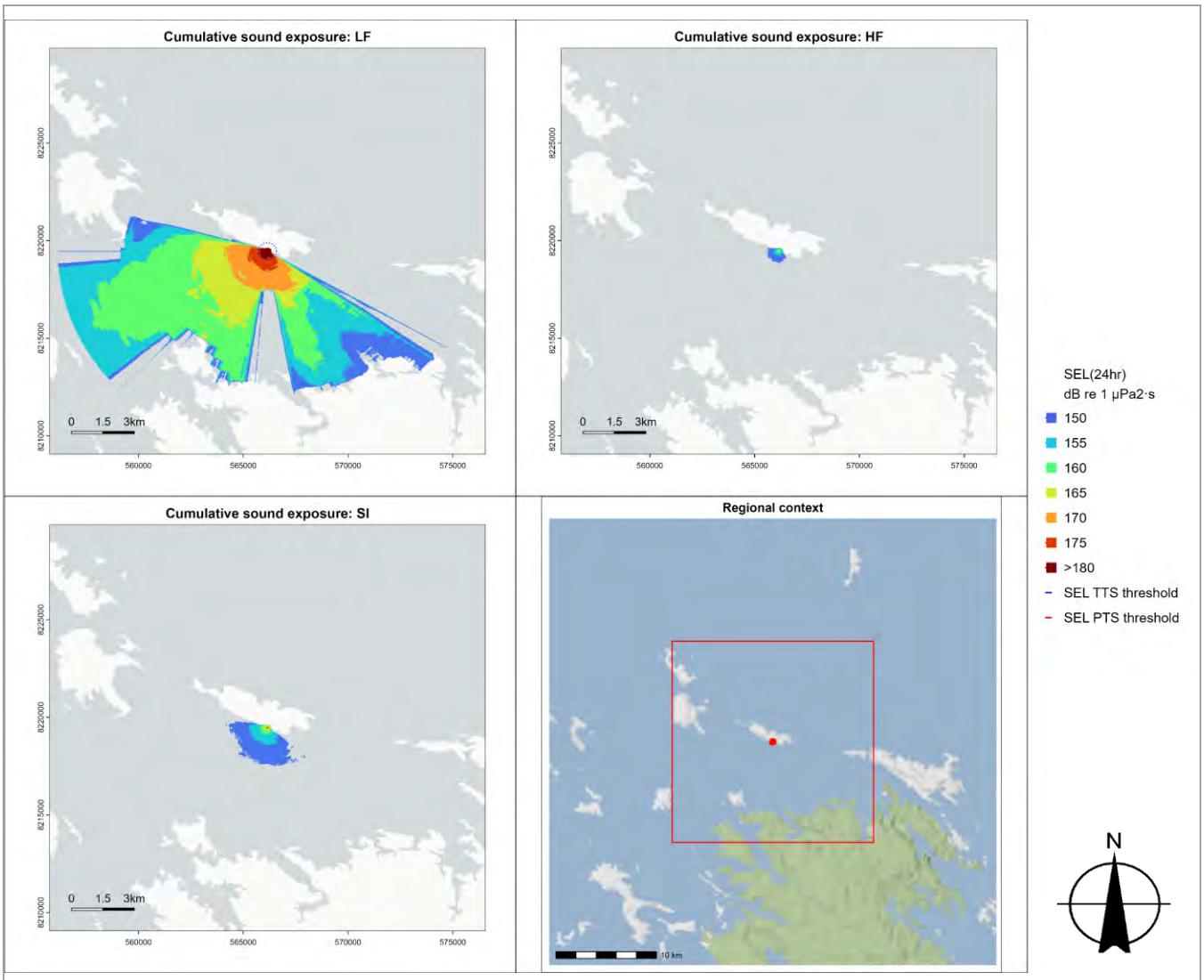
Scenario	SEL_{24hr} Threshold, dB re 1 $\mu Pa^2 \cdot s$	Rock dumping, SEL_{24hr}			Rock placement, SEL_{24hr}		
Operating period		**12hr**	**10hr**	**8hr**	**12hr**	**10hr**	**8hr**
Permanent Threshold Shift (PTS)							
LF	**199**	-	-	-	10	10	10
HF	**198**	-	-	-	-	-	-
SI	**206**	-	-	-	-	-	-
Temporary Threshold Shift (TTS)							
LF	**179**	140	120	110	430	380	330
HF	**178**	90	80	70	-	-	-
SI	**186**	40	30	30	-	-	-



Map projection: Transverse Mercator
Horizontal Datum: MGA20
Grid: MGA20 Zone 51

Data source: StadiaMaps
Date: 13/03/2025
Creator: R Browell

Figure 4.10 ***SEL_{24hr} azimuth isopleths and R95% range to PTS/TTS thresholds: Rock dumping (activity duration: 12 hours operation in 24 hours)***



Map projection: Transverse Mercator **Horizontal Datum:** MGA20 **Grid:** MGA20 Zone 51	GHD	**Data source:** StadiaMaps **Date:** 13/03/2025 **Creator:** R Browell	*Figure 4.11* ***SEL_{24hr} azimuth isopleths and R95% range to PTS/TTS thresholds: Rock placement (activity duration: 12 hours operation in 24 hours)***

Fish species

For fish species without swim bladders and those with swim bladders not involved in hearing, due to lack of quantitative assessment criteria as indicated in Table 4.19, it is not possible to draw clear zones of impact. However, the following impact assessment conclusions can be made based on generic qualitative assessment criteria for fish and sea turtle species due to non-impulsive noise exposures:

– For fish species with no swim bladder (e.g. whale sharks) or with a swim bladder not involved in hearing (e.g. yellowfin tuna):
  - the risk of mortality, potential mortality and recovery injury is '**low'** at all distances from the source
  - the risk of TTS onset is '**moderate'** near the source, and '**low'** at all other distances
– For fish eggs and fish larvae:
  - the risk of mortality, potential mortality and recovery injury is '**low'** at all distances from the source
  - the risk of TTS onset is injury is '**low'** at all distances from the source

The thresholds set for fish with a swim bladder that is involved in hearing, for example pipefish and seahorse species, are not met within the study area and therefore no risk is expected for injury or hearing impairment to these species.

Sea turtles

Cumulative exposure thresholds have been set for physiological and hearing loss impacts for sea turtles, outlined in Table 4.19. These thresholds are not exceeded for either rock dumping or rock placement for up to 12 hours of operation within a 24hr period. As such hearing impairment (PTS or TTS) is unlikely for sea turtles from the proposed works.

4.6.4.1.3 Reduction in marine environmental quality

A temporary reduction in water quality during construction may occur during placement of fill material. A reduction in water quality may occur through re-suspension of fine material that could smother benthic habitat, reducing light climate reaching photosynthetic organisms (i.e. macroalgae and hard coral) that serve as habitat for other marine fauna.

During construction, a number of solid and liquid wastes will be generated on both land and any vessels, including sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils, and excess concrete and asphalt. If released into the marine environment, hazardous and non-hazardous discharges could affect benthic communities and habitats, and other associated marine fauna, through localised toxic effects and reduction in water quality.

4.6.4.1.4 Introduction of invasive marine species

Vessels and marine equipment will be required during construction. Invasive Marine Species (IMS) can be carried by the vessel in ballast tanks, biofouling on the hull and internal systems, and in sediments collected around marine equipment. A successful translocation of an invasive marine species could out-compete the existing marine fauna.

4.6.4.1.5 Marine fauna interactions with vessels

The physical presence and movement of construction vessels and reclamation of the bay has the potential to impact marine fauna. Impacts may range from behavioural (e.g. changes in surfacing patterns, swimming speed, duration underwater) to injury (e.g. propeller lacerations) or mortality (e.g. vessel strike, crushed by rocks).

4.6.4.2 Operational phase impacts

4.6.4.2.1 Changes to benthic communities, habitat and waters

The floating wharf and moored vessels at the wharf will reduce light reaching the seabed beneath. Any photosynthetic benthic communities such as hard coral or algae may be affected by the reduced light climate, which may affect marine fauna that previously utilised this area. Conversely, shaded structures also attract some marine fauna species as an area of refuge.

Based on observations of marine fauna on or around the existing ship loader piles, it is anticipated that a similar community assemblage will colonise the proposed wharf infrastructure. This would eventually provide alternative food sources, habitat and refugia for some marine fauna species.

4.6.4.2.2 Reduction in marine environmental quality

A number of solid and liquid wastes will be generated during operations on the wharf and visiting vessels, and hazardous materials will be stored on the wharf. These include marine gas oil, sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils, hydraulic oils and cleaning fluids. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect marine fauna through direct toxicity, ingestion or entanglement.

4.6.4.2.3 Introduction of invasive marine species

IMS can be carried by operational vessels in ballast tanks, biofouling on the hull and internal systems, and on marine equipment. A successful translocation of an invasive marine species could out-compete the existing benthic communities.

4.6.4.2.4 Light emissions

Operations could occur 24 hours a day and navigational and safety lighting will be required that may affect marine fauna behaviour.

Continuous lighting in the same location for an extended period may result in alterations to normal marine fauna behaviour, as summarised below for each fauna group:

Fish and Zooplankton

– Attraction of some fish and zooplankton species to light, which may alter local predator-prey interactions (Milicich *et al*. 1992).

Marine Turtles

The DE contains habitats likely to provide food sources for juvenile and adult marine turtles. Flatback, green, and hawksbill turtles are known to use the nearshore waters along the mainland coast and around islands for inter-nesting and migration routes (Ferreira et al. 2020; Fossette et al. 2021; Whittock et al, 2016).

Because there is no evidence to suggest adult marine turtles use light as a cue at sea, and because foraging, internesting, and migrating marine turtles remain largely submerged the likelihood of these age classes being exposed to directly visible light and sky glow is possible. Once the control measures outlined in the OEMP are applied, including the shielding and redirection of lighting and the use of lights with suitable wavelengths and intensities, the exposure to light is reduced to unlikely and the risk of any residual impact due to project lighting is low.

Seabirds

*S*pecies with a nocturnal component of their life history, such as procellariforms (taxonomic order that comprises albatrosses, petrels, and shearwaters), include the wedge-tailed shearwater, that breeds on offshore islands. These species are at greater risk of negative impacts. The bulk of the literature concerning impacts of lighting upon procellariforms relate to the synchronised mass exodus of fledgling seabirds from their nesting sites (Deppe et al. 2017; Raine et al. 2007; Rodriguez et al. 2015a; Rodriguez et al. 2015b; Le Corre et al. 2002; Reed et al. 1985), with fewer investigating the impacts of light at sea. Reports of interaction between seabirds and artificial light at sea is generally anecdotal following significant interaction events (e.g. Black 2005), or by unsystematic monitoring by oil and gas operators (e.g. Day et al. 2015; Glass & Ryan 2013; Wiese et al. 2001; Ronconi et al. 2015).

Deck lights and spotlights on fishing vessels have been recorded attracting numerous seabirds at night, particularly on nights with little moon light or low visibility (Black 2005; Merkel & Johansen 2011; Montevecchi 2006).In an overview of seabirds and migratory shorebirds of the north-west marine region (Commonwealth of Australia 2012a), bright lighting was found to disorient flying birds and subsequently cause their death through collision with infrastructure or starvation due to disruptions in the ability to forage at sea (Wiese et al. 2001). Light pollution is a particular issue for wedge-tailed shearwaters due to their nocturnal habits and migratory shorebirds as they undertake their migratory flights at night (Geering et al. 2007).

Diurnal seabird species, such as frigatebirds, terns, noddies, and boobies, in contrast, are less vulnerable to impacts resulting from nocturnal behaviours. However, the presence of facilities can alter foraging behaviours and provide artificial roosting sites.

The DE contains habitats likely to provide food sources and shelter for roosting seabirds. While sparse, information summarised above suggests that seabirds may be sensitive to light across the entire spectrum, depending upon the behaviour being undertaken. Sensitivity to shorter wavelengths (ultraviolet and blue) during foraging may occur in some species, depending on the foraging strategy. Unmitigated, it is possible that direct light will illuminate foraging habitat, influencing foraging behaviour, or displace seabirds from roosting areas. Attraction of migrating birds to artificial light may also occur.

Sensitivities of seabird species to artificial light could potentially alter their use of this area, however, with control measures for lighting outlined in the OEMP applied, the impact is unlikely to be significant. Implementing the design parameters outlined in the OEMP, light spill onto nocturnal habitats, which may displace individuals, will be reduced. Further, light spill onto intertidal foraging habitats will be limited to areas immediately adjacent to the floating wharf. The absence of light spill illuminating the habitat will prevent displacement from occurring. Accordingly, with mitigation applied, potential impacts are expected to be limited to localised changes in foraging behaviours of a small number of individuals within the DE. Prevention of upward light spill and avoidance of red lights will reduce the likelihood of migrating birds becoming disorientated.

4.6.4.2.5 Marine fauna interactions with vessels

During normal operations, there may be approximately fourteen vessel movements to and from the Island per week. Vessel movements have the potential to cause behavioural effects (e.g. changes in surfacing patterns, swimming speed, duration underwater) to injury (e.g. propeller lacerations) or mortality (e.g. vessel strike) to marine fauna.

A Marine Traffic Movement Summary has been prepared to document changes to marine traffic as a result of the proposal (Crestlink 2025). The overall impact on vessel visits to the region due to Cockatoo Island is a net zero increase (between Broome and Darwin):

– ~75 additional oil and gas vessel movements into Port of Yampi Sound per year that would otherwise have travelled to Darwin.
  - These vessels no longer travel through the Oceanic Shoals Marine Park but now travel through the Kimberley Marine Park.
– ~120 additional oil and gas vessel movements into Port of Yampi Sound per year that would otherwise have travelled to Broome.
  - these vessels will continue to travel through the Kimberley Marine Park
– Cruise vessels, fishing and private charters already travel through this area.
– Government (Navy, Customs, Fisheries) already travel through this area.

4.6.4.2.6 Noise emissions

During operations, underwater noise will be generated by the vessel operations and workshop activities. Underwater noise may impact marine fauna by:

– Causing behavioural changes including displacement from biologically important habitat areas (such as feeding, resting, breeding, calving and nursery sites)
– Masking or interference with other biologically important sounds such as communication or echolocation systems used by certain cetaceans for navigation and location of prey
– Causing physical injury to hearing and other internal organs
– Indirectly impacting predator or prey species.

Underwater noise generated from workshop activities is highly unlikely to cause material noise impacts to marine fauna.

4.6.5 Assessment of impacts

The planned activities are unlikely to have a significant impact on marine fauna due to a number of factors:

– Previous activities within Cockatoo Islands marine environment involved wharf construction, ship movements and ship loading with no reported marine fauna strikes. The operational expansion at Cockatoo Island will redistribute existing vessel traffic rather than increase total movements in the region. Enhanced regulatory oversight and adherence to KPA safety measures will ensure safe navigation while minimising impact, on marine fauna.
– Noise from land-based mining activities included blasting and 24 hour vehicle movements that were not observed to impact marine fauna.

- The loss of the marine habitats will be partially offset with new colonisable areas and refugia created by the land reclamation and floating wharf.
- The 0.54 ha of foraging habitat present within the proposed impact area is not considered significant as adjacent bays have considerately more benthic habitats available for marine fauna usage.
    - This habitat is considered to support foraging for the following species:
        - Australian Humpback Dolphin (*Sousa sahulensis*)
        - Indian Ocean Bottlenose Dolphin (*Tursiops aduncus*)
        - Bottlenose Dolphin (Tursiops truncates s. str.)
        - Green Sawfish (*Pristis zijsron*)
        - Largetoothed Sawfish *(Pristis pristis*)
        - Narrow Sawfish (Anoxypristis cuspidata)
        - Reef Manta Ray (*Manta alfredii*)
        - Giant Manta Ray (*Manta birostris*)
        - Scalloped Hammerhead (*Sphyma lewini*)
        - Northern River Shark (*Glyphis garricki*)
        - Southern Bluefin Tuna (*Thunnus maccoyii*)
        - Green Turtle (*Chelonia mydas*)
        - Leatherback Turtle (*Dermochelys coriacea*)
        - Flatback Turtle (*Natator depressus*)
        - Hawksbill Turtle (*Eretmochelys imbricata*)
        - Olive Ridley Turtle (*Lepidochelys olivacea)*
    - The benthic habitat within the DE proposed to be disturbed by the proposal does not support breeding nor is it considered critical habitat for any of the above marine fauna species. Further, on Cockatoo Island, there are no known turtle nesting beaches.
- Reclamation of primarily the intertidal flats of Bay 1 will be staged from the shoreline and progressively move to the offshore extent at the ledge to deeper subtidal waters. This approach should provide audible and vibratory disturbance that will result in the migration of local motile marine fauna in Bay 1 to other areas
- No dredging is required
- Construction vessels will largely be stationary once in the bay
- Fill material will be benign mine waste with low fine sediment content and no known contaminants
- Any accidental (unplanned) spillages or releases of wastes or discharges will quickly disperse due to the large tidal range of the area
- Fluxes in total suspended solids are common in the wider area and are related to large tidal movements and seasonal high rainfalls.

4.6.6 Cumulative Impact Assessment

The Proposal is not expected to contribute to cumulative impacts to Marine Fauna within the region. The project will not increase the number of vessels that operate within the region given it is providing support to other projects which is independent to the implementation of this proposal. Vessel movements will be contained to existing shipping channels and movements within the Yampi Soud port will be governed by the Port Of Yampi Sound Port And Terminal Handbook (KPA 2024).

4.6.7 Mitigation

A Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) have been prepared to manage and mitigate potential impact as a result of the construction and operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised

through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.22.

Table 4.22 Proposed mitigation measures for marine fauna

Potential Impact	Proposed mitigation		
	Avoid	Minimise	Significant Residual Impact?
Construction Phase			
Underwater noise impacts from reclamation construction activities	– Construction of wharf facility using land reclamation and rock dumping only, removing the requirement for piling.	Implement CEMP (Appendix B) including: – Dedicated marine fauna observers to be used during reclamation construction. – Maintenance of visual observation and exclusion zones during reclamation construction. – Pre-start, soft-start, and shut-down procedures during reclamation construction In accordance with EPBC Act Policy Statement 2.1 Part A (DEWHA 2008), during land reclamation construction activities: • An observation zone of 450 m within which the movement of marine mammals would be monitored to identify any approach to the project site • Pre-start up visual observation of precaution zones (>30 minutes before soft start) • Rock dumping will not commence if cetaceans or turtles are within low power or shut-down zone • Trained crew will maintain vigilant observation for marine cetaceans and turtles within precaution zones and vessel planned path throughout rock dumping activities • Rock dumping will cease if cetacean or turtle enters shut-down zone • Relevant crewmembers are briefed on EPBC Act Policy Statement requirements, soft start, start-up delay, operations and stop work procedures, nighttime and low visibility procedures. • In accordance with Part 8 of the EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area – Reclamation construction to be undertaken during daylight hours. – Crew trained as marine fauna observers to be used during reclamation construction.	No
Light pollution during construction activities	All non-essential lighting to be switched off when not in use.	– Ensure mobile light sources are not oriented seaward and to keep the height of these to a minimum. – Increased lighting will be minimal and uphold National Light Pollution Guidelines (DCCEEW, 2023). – Consideration to whether activities requiring illumination of problem lights can be undertaken during daylight hours only.	No
Marine fauna interaction with vessels	In accordance with Part 8 of the EPBC Regulations (Vessels), all construction vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area.	Implement CEMP (Appendix B) including: – 'Trained' MFOs will be used, at least one crew member on each vessel will undergo training in marine fauna observations to undertake this task . – Incident reporting	No
Introduction of IMS	n/a	Implement CEMP (Appendix B). – Preferential use of local construction vessels – Best practice cleaning and inspections of construction vessels prior to leaving last port of origin – Maintain ant-fouling coating on vessels – Requirement for all vessels arriving from international locations to comply with Commonwealth DAFF – Biosecurity requirements. – Maintain best practice ballast water plans, records and ballast exchange methods – Carry out pre- and post-construction IMS surveys.	No
Reduction in MEQ effecting/impacting marine fauna	As per Section 4.5.6 and implement CEMP (Appendix B)		No
Direct loss of BCH and waters for marine fauna habitat	As per Section 4.3.6 and implement CEMP (Appendix B)		No
Operational Phase			
Light pollution during operational activities	– All non-essential lighting to be switched off when not in use.	Implementation of lighting management as detailed in OEMP: – Lighting of the vessels will be reduced to navigation lighting only when not operational; – Lighting to be directed inwards and at a low vertical angle; Implementation of lighting design concept as detailed in Appendix B of OEMP:	No

Potential Impact	Proposed mitigation		
	Avoid	Minimise	Significant Residual Impact?
		– Minimum number and intensity of lights; – Adapt lighting for colour, intensity and timing; – Light only the area intended; and – Use non-reflective, dark coloured surfaces.	
Marine fauna interaction with vessels	– In accordance with Part 8 of the EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area.	Implement OEMP (Appendix B) including: – Environmental awareness induction will be provided to vessel crew that include marine fauna interaction requirement – Incident reporting	No
Introduction of IMS	n/a	Implement OEMP (Appendix B). – Preferential use of local operation vessels – Best practice cleaning and inspections of operations vessels prior to leaving last port of origin – Maintain ant-fouling coating on vessels – Requirement for all operations vessels from international locations to comply with Commonwealth DAFF – Biosecurity requirements. – Maintain best practice ballast water plans, records and ballast exchange methods – Carry out operational phase IMS surveys once every 2 years	No
Reduction in MEQ effecting/impacting marine fauna	As per Section 4.5.6 and implement CEMP (Appendix B)		No
Changes in BCH and effect on marine fauna habitat	As per Section 4.3.6 and implement CEMP (Appendix B)		No

4.6.8 Predicted outcomes

Given the proposed mitigation measures, lack of known critical marine fauna habitat in the bay and comparably less BCH than adjacent bays, the activities are not expected to result in any significant losses of marine fauna. There may be some losses during the reclamation process, but progressive reclamation will allow motile marine fauna to relocate.

During reclamation, there is likely to be behavioural avoidance of the area but not direct physical trauma. Any impacts to behaviour will be limited to transient individuals near to the activity, as the area is not significant for cetaceans or turtles. Migrating species that may pass through the area will be able to navigate around any point source disturbance.

With adherence to the management controls proposed during the activities potential impacts are considered acceptable.

4.7 Key environmental factor - flora and vegetation

4.7.1 EPA objective

To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

4.7.2 Policy and guidance

– Environmental Factor Guideline – Flora and Vegetation (EPA 2016a)
– Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b).

4.7.3 Receiving environment

Baseline studies relevant to the Proposal are provided in Table 4.23.

Table 4.23 Baseline studies – flora and vegetation

Consultant	Survey Name
ecologia (2025) – Appendix A15	Cockatoo Island Multi-Use Supply Base Targeted Fauna And Flora Survey
Astron Environmental Services (2012)	Cockatoo Island Weed Survey
ENV Australia (2008)	Cockatoo Island Declare Rare and Priority Flora Species Search
GHD (2014) – Appendix A9	Cockatoo Island Flora, Fauna and SRE Surveys
GHD (2017a) – Appendix A10	Cockatoo Island Multi-User Supply Base. Technical Study - Terrestrial Flora and Fauna
Outback Ecology Services (2009)	Cockatoo Island Rehabilitation Planning

Vegetation types

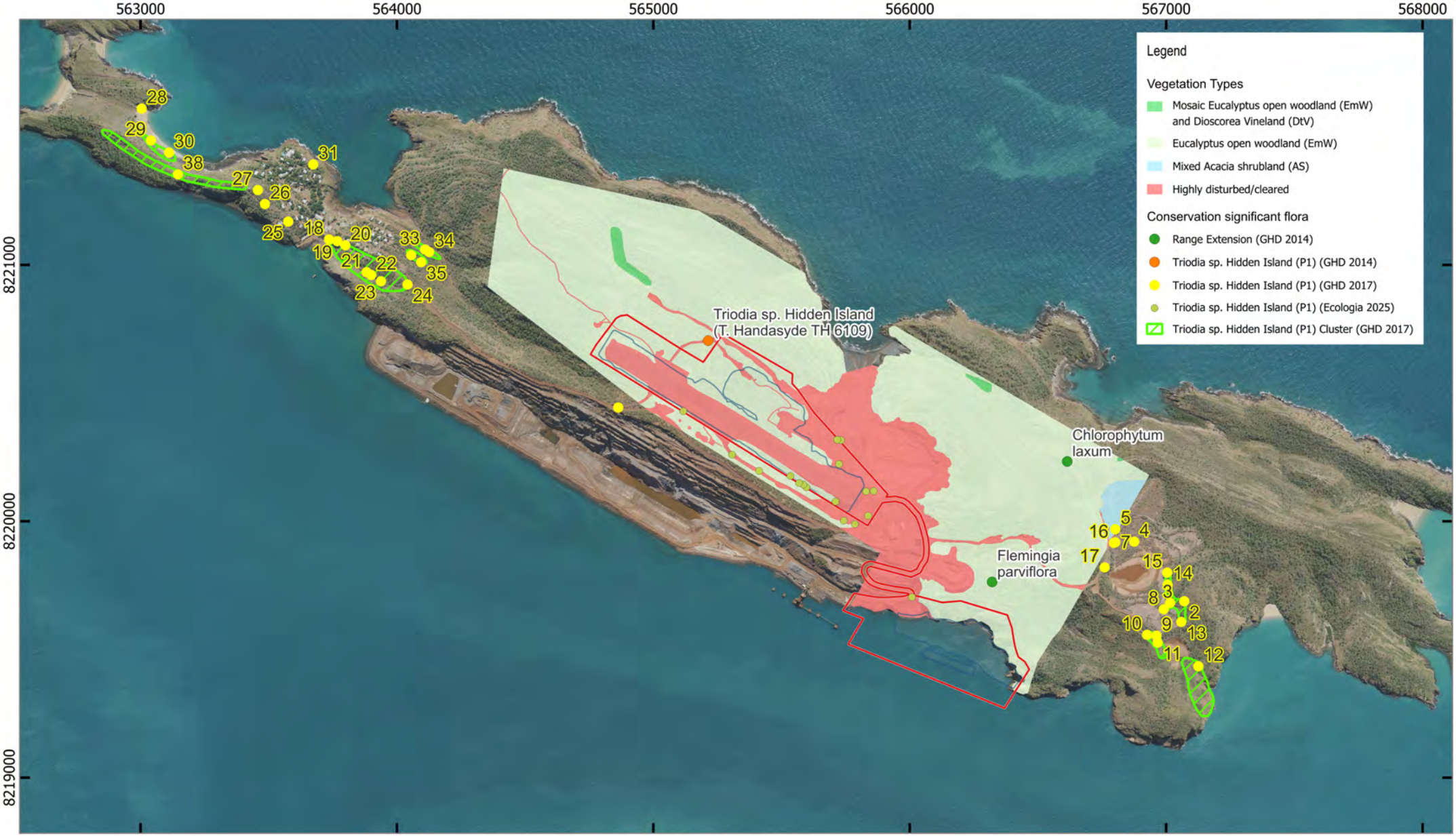
A survey area surrounding the Proposal was assessed for vegetation and flora over a number of visits to the Island. The survey area supports three vegetation associations (GHD 2017a) as well as highly disturbed/cleared areas (Figure 4.12). Vegetation is dominated by Eucalyptus open woodland, which occurs across 151.46 ha of the survey area, on hillslopes, cliffs, valleys and gullies. Other vegetation associations present include 1.35 ha of *Dioscorea* Vineland (DtV) and *Eucalyptus* open woodland mosaic (EmW), and 2.17 ha of Mixed *Acacia* shrubland (AS) (Table 4.24).

Vegetation throughout the western part of the survey area was impacted by fire in May 2016, which has altered the vegetation structure. However, this is likely a temporal change with extensive natural regeneration observed in December 2016 and May 2017 (GHD 2017a).

Significant vegetation

None of the vegetation associations on the Island are considered to be Threatened Ecological Communities (TECs) or State listed Priority Ecological Communities (PECs).

Two vegetation associations known to occur on Cockatoo Island outside of the survey area, mangroves and vineland (equivalent to rainforest patches), are considered to be ‘other significant vegetation’ (EPA 2016b). No mangrove vegetation occurs within the survey area. A very small area of true vineland (*Dioscorea* Vineland) occurs outside of the survey area on the northern side of the Island at No. 3 North Bay.



Paper Size ISO A4

0 100 200 300 400

Metres

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Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Vegetation Associations and Conservation Significant Flora Locations

Project No. **12526793**
Revision No. **E**
Date. **28/03/2025**

FIGURE 4-12

Document Path:
Print Date: 28 March 2025

Data Source:WANow
Created By: Tristan Sleigh

Table 4.24 Vegetation association within the survey area

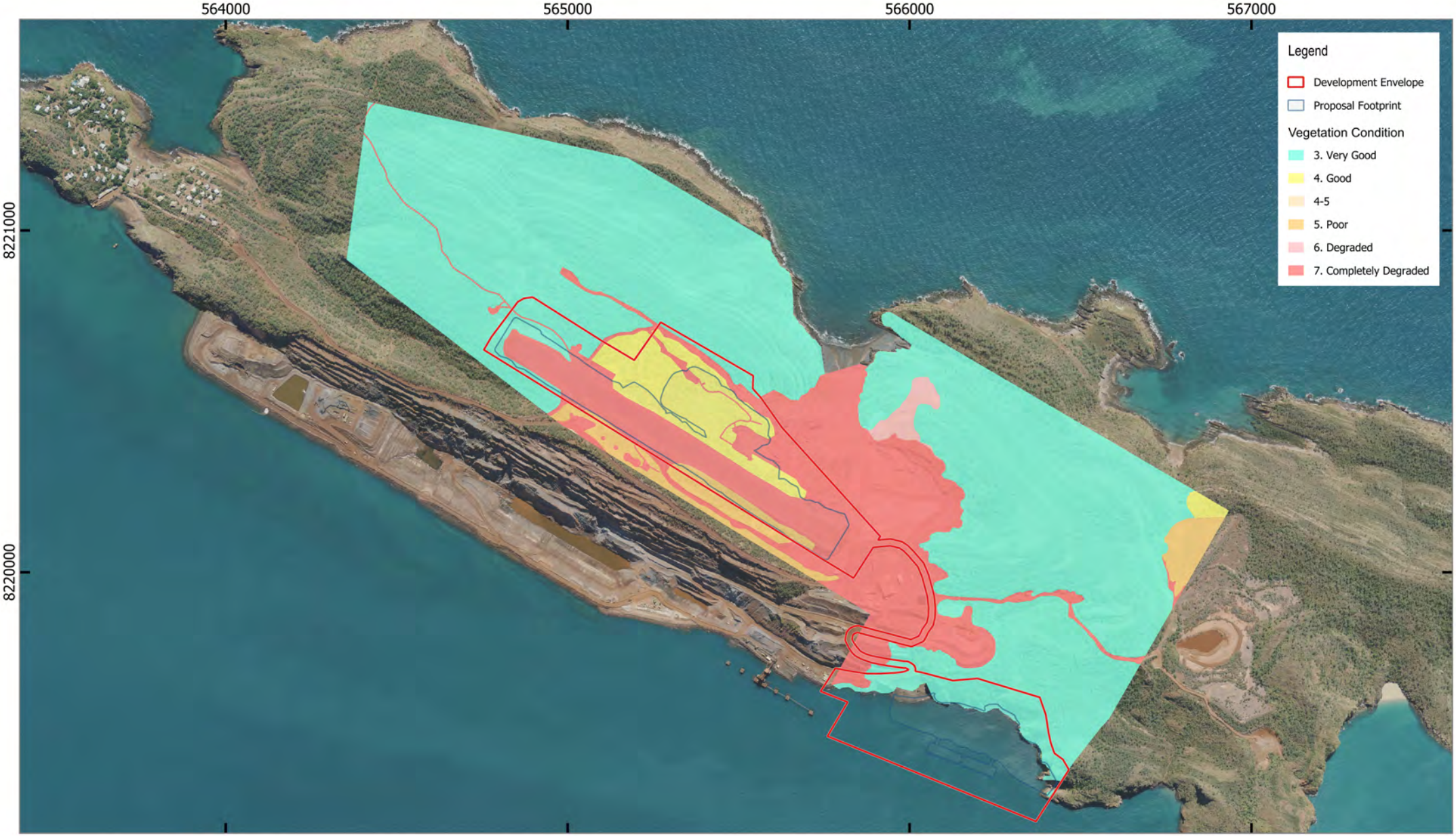
Vegetation code	Vegetation association description	Landform and extent	Photograph
Eucalyptus open woodland (EmW)	*Eucalyptus miniata, Corymbia cadophora, Brachychiton diversifolius* open low woodland over *Calytrix exstipulata, Grevillea agrifolia* subsp. *agrifolia*, *Buchanania obovata* tall sparse shrubland over *Calytrix exstipulata, Bridelia tomentosa, Acacia stigmatophylla* sparse shrubland over *Dodonaea hispidula, Hibbertia oblongata, Acacia hippuroides* low shrubland over *Triodia bynoei* and *T. pungens* hummock grassland over *Sorghum plumosum, Heteropogon contortus, Eriachne avenacea*, *Cymbopogon* sp. sparse tussock grassland over *Trachymene didiscoides* isolated herbs over *Cassytha candida, Gossypium costulatum* and often **Passiflora foetida* open vineland.	Hillslope, cliffs, valleys and gullies 151.46 ha	
Dioscorea Vineland (DtV) and *Eucalyptus* open woodland (EmW) mosaic	*Canarium australianum* subsp. *australianum, Sersalisia sericea* woodland with *Eucalyptus miniata*, *Corymbia cadophora* isolated trees over *Pavetta kimberleyana, Grevillea agrifolia* subsp. *agrifolia* mid- to tall open shrubland with *Dioscorea transversa, Ampelocissus acetosa, Tinospora smilacina, Flagellaria indica* vineland over open herbland of *Tacca leontopetaloides*.	Limited to very small areas in valleys 2.17 ha	
Mixed *Acacia* shrubland (AS)	*Acacia colei var. colei, Acacia tumida* var. *tumida* tall shrubland.	Dam, embankment and hillslope 1.35 ha	

Vegetation condition

Large sections of Cockatoo Island have been subject to major disturbances in the past, which include the development of mining areas, an airstrip, accommodation village and associated infrastructure area. Approximately 150 ha (28%) of the Island is mapped as being Disturbed or Highly Disturbed (GHD 2014). Despite these localised areas of major disturbance, the remaining areas of the Island support remnant vegetation, of which the majority is in excellent condition (GHD 2014).

Areas of *Eucalyptus* open woodland in the eastern and western parts of the survey area are in Very Good condition (Figure 4.13). Vegetation structure in these areas is intact, and disturbances include repeated fires, the presence of relatively non-aggressive weeds and occasional vehicle tracks.

Several areas adjacent to the existing airstrip and/or mine were rated as Good to Good-Poor (Figure 4.13). These areas show more obvious impacts to vegetation structure, and disturbances included partial clearing and the presence of more aggressive weeds. Areas associated with the tailings dam are in Degraded condition and have been previously cleared and comprise natural regrowth mostly limited to several *Acacia* species (GHD 2017a).



Paper Size ISO A4

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Metres

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

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GHD

Kimberley Technology Solutions

Cockatoo Island Multi-User Supply Base

Vegetation Condition

Project No. **12526793**
Revision No. **E**
Date. **28/03/2025**

FIGURE 4-13

Document Path:
Print Date: 28 March 2025

Data Source:WANow
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Flora diversity

Flora diversity recorded on Cockatoo Island is comparable to numbers recorded on nearby Irvine Island and Koolan Island (GHD 2014).

Conservation significant flora

No flora taxa currently listed under the EPBC Act or *Wildlife Conservation Act 1986* (WC Act) have been recorded from Cockatoo Island.

One species of Priority flora, *Triodia* sp. Hidden Island (T. Handasyde TH 6109) – Priority 1, has previously been recorded from the survey area.

Triodia sp. Hidden Island is known from seven collections on Hidden Island, located approximately 22 km south-west of Cockatoo Island (in 2009 and 2010), where it is found in rocky locations. Collection of this species on Cockatoo Island by GHD (2014) represented the first record outside of Hidden Island. The specimen recorded by GHD (2014) was collected from one location in the central part of the Island, to the north of the existing airstrip. This plant was located adjacent to an access track within an area that had historically been used as a material dump.

Further attempts in 2016 to identify *Triodia* sp. Hidden Island at the previously known location were unsuccessful due to an extensive bushfire that had burnt through the area in May 2016 (GHD 2017a). A follow up survey in May 2017 identified the occurrence of *Triodia* sp. Hidden Island at a number of locations on the Island. Over 1,300 plants were recorded. All occurrences were outside of the area that will be impacted by the development, but its presence cannot be discounted in the Proposal area due to the temporary impacts of the 2016 fire.

The targeted flora survey undertaken by ecologia (2025) recorded 17 additional locations of *Triodia* sp. Hidden Island within the DE of which there were 500 individual plants (Figure 4.12).

Other significant flora

Two species recorded from Cockatoo Island represent range extensions and as such are likely to be considered 'significant flora' as defined by the EPA (2016a) (Table 4.25). One of these species, *Flemingia parviflora*, has been recorded from the survey area but outside of the disturbance footprint.

Table 4.25 Species recorded as range extensions and their current known range

Species	Known locations (WA Herbarium 1998– and DPaW 2007–)
Flemingia parviflora	11 locations including the Mitchell Plateau, Beverley Springs Station and near King Edward River, with the nearest record approximately 200 km north-east of Cockatoo Island
Chlorophytum laxum	Recorded within the Mitchell IBRA subregion; with the nearest record approximately 200 km east of Cockatoo Island

Introduced and invasive species

No Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) or Weeds of National Significance (WoNS) have been recorded from within areas of native vegetation on Cockatoo Island. One WoNS, *Lantana montevidensis* occurs within the townsite as a cultivated plant however this species does not appear to have established outside of maintained areas (GHD 2014).

A total of 33 introduced (weed) species have been recorded from Cockatoo Island, of which 16 are naturalised and occur within the vegetated areas of the Island. Most of these taxa are widespread throughout the Kimberley region (GHD 2014).

GHD (2017a) recorded six introduced species within the Proposal area. Weed species were generally recorded in disturbed areas with the exception of Stinking Passion Flower (**Passiflora foetida*) and **Melinis repens* which are more widespread.

4.7.3.1 Adequacy of survey

The survey (GHD 2017a) undertaken across the project area was undertaken in accordance with EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment. (EPA 2016b). This survey built on the data results collected during the previous survey in 2013 (GHD 2014).

The survey undertaken in December 2016 and May 2017 (GHD 2017a), provides data and results that were, at the time of referral of this project (2017), within the suggested 5-year post survey period, ensuring result validity. At the time of submission of the document, the survey results are approximately eight years old, and the results presented are outside of the recommended survey age for impact assessment. At the time of referral, the extent of survey was accepted as adequate to inform impact assessment. The additional targeted flora survey undertaken in February 2025 (ecologia 2025; Appendix A) was conducted within the proposed DE to provide an updated census of conservation significant flora species with potential to be impacted by the proposal. On review of the reports, the results and data presented are adequate to inform impact assessment due to the following:

– Updated database searches have indicated that no additional conservation significant flora species or ecological communities are likely to occur within the project area
– No additional impacts have been identified within the survey area since the assessment was undertaken and as such the current quality and composition of the vegetation communities present is expected to be consistent with the mapping provided in the 2017 GHD report.
– No clearing had been undertaken across Cockatoo Island since the 2013 survey was undertaken, which described the extent of vegetation across the entirety of the Island, providing local context to impacts.
– Updated targeted survey was conducted during the appropriate season and provides a temporal update of the extent of conservation significant flora species within the DE.

4.7.4 Potential impacts

The Proposal will result in the direct loss of native vegetation and flora including:

– Up to 7.37 ha of *Eucalyptus* open woodland, 0 ha of *Dioscorea* Vineland and *Eucalyptus* open woodland mosaic, and 0 ha of Mixed Acacia shrubland (Table 4.26)
– Up to 6.39 ha of vegetation in Good to Very Good condition (Table 4.27)
– Direct loss of 145 individuals of the Priority 1 listed *Triodia* sp. Hidden Island.

The Proposal could also result in the following indirect impacts to vegetation and flora:

– Possible introduction and/or spread of weeds to adjacent vegetation
– Changes in local hydrology due to alteration of surface water flows
– Increased dust on leaf surfaces during construction activities.

Table 4.26 Clearing of local vegetation associations

Element	Maximum area of disturbance (ha)				
	Cleared area / existing disturbance	*Eucalyptus* open woodland	Mixed *Acacia* shrubland	Eucalyptus open woodland and *Dioscorea* Vineland	Total
Airfield, apron and support services	11.48	7.37	0	0	**18.84**
Total	**11.48**	**7.37**	**0**	**0**	**18.84**

Table 4.27 Vegetation conditions

Element	Maximum area of disturbance (ha)					
	Very Good (3)	Good (4)	Poor (5)	Degraded (6)	Completely Degraded (7)	Total
Airfield, apron and support services	1.10	5.29	0.97	0	11.48	**18.84**
Total	**1.10**	**5.29**	**0.97**	**0**	**11.48**	**18.84**

4.7.5 Assessment of impacts

4.7.5.1 Clearing of native vegetation

Extent of vegetation types

One of the vegetation types identified within the Proposal area is broadly consistent with the pre-European vegetation association (Beard 1977):

– Grasslands, curly spinifex, low tree savanna; bloodwood (*Eucalyptus dichromophloia* [*Corymbia dichromophloia*]) and woolybutt [*Eucalyptus miniata*] over curly spinifex on Islands (association 8001).

The extent of the Beard vegetation association 8001 has been determined by the state-wide vegetation remaining extent calculations maintained by the DPaW (current as of June 2015 – Government of Western Australia (GoWA) 2015). As shown in Table 4.28, the extent of vegetation association 8001 is greater than 85% of the pre-European extent remaining at all scales (e.g. State, IBRA bioregion, IBRA subregion and local government authority (LGA)). There is less than 0.015% of the current extent of this vegetation association within the Proposal area at the Bioregion level.

Table 4.28 Vegetation association 8001 extent (Beard 1977, GoWA 2015)

Scale	Pre-European Extent (ha)	Current Extent (ha)	Remaining (%)
State: WA	237,440.25	203,756.79	85.81
Bioregion: Northern Kimberley	219,927.66	200,503.71	91.17
Sub-region: Mitchell	219,927.66	200,503.71	91.17
LGA: Shire of Derby-West Kimberley	233,722.26	201,062.33	86.03

Regional and local significance

The regional and local significance of the vegetation types was assessed by incorporating and adapting relevant characteristics as outlined in EPA (2016b). Characteristics included:

– Degree of degradation/clearing within Northern Kimberley IBRA Bioregion, Mitchell IBRA Subregion and Shire of Derby-West Kimberley LGA
– Size of remnant and condition/intactness of vegetation
– Heterogeneity or complexity of vegetation
– Rarity of vegetation
– Presence of other significant vegetation
– Representation of ecological refuge or linkage
– Presence of Threatened, Priority or other significant flora taxa.

The vegetation types within the disturbance area are:

– Not considered to be regionally or locally significant
– The vegetation types are considered to be well represented on and outside of Cockatoo Island – with only 2% of the *Eucalyptus* open woodland on the Island (based on mapping in GHD 2014) proposed to be cleared.

Priority Flora

The number of individuals of *Triodia* sp. Hidden Island that will be directly impacted by the proposed clearing represents 12% of the total known population within Cockatoo Island (Table 4.29). More than half of the individuals recorded during the supplementary 2025 targeted survey (ecologia 2025) were located within previously disturbed, highly degraded areas. This suggests that the species has the ability to colonise degraded areas of vegetation and that the Proposal, while reducing the local population by 12%, is unlikely to impact the local populations. These individuals were not present during the previous targeted survey in 2017, demonstrating the species ability to

colonise. Based on the low impact to the local population and the ability of the species to colonise degraded and disturbed areas, the proposal is not considered to have a significant impact on this species. Given the local population is unlikely to be significantly impacted by the Proposal, and there are no proposed impacts to the other known locations, the proposal is not considered to have a significant impact on this species at a regional scale.

Table 4.29 Impacts to priority flora

Taxa	Number of individual directly impacted	Local population (within Cockatoo Island)	Local Impact (%)	Regional Impact
Triodia sp. Hidden Island	145	1171	12%	Known from 2 island locations within the region. This record represents one of the 2 locations.

4.7.5.2 Alteration of surface water flows

The construction of the upgraded airfield and apron has the potential to indirectly impact flora and vegetation values through the alteration of surface water flows. An increase in surface water flow in vegetation as a result of the sealing of the airstrip and construction of the apron has the potential to:

– Increase the density of weed species present due to increased water availability
– Modify the structure and composition of the adjacent vegetation due to increased water availability
– Transport erodible soils smothering low growing shrubs ang grasses, and impacting growth and structure of adjacent vegetation.

These potential impacts are expected to be minor should they occur due to the following:

– No additional fragmentation of native vegetation is proposed to occur. The clearing required for the airfield construction is limited to vegetation adjacent to the existing airstrip, with no islands of vegetation proposed to be created. The clearing required for the apron construction is within vegetation already subject to fragmentation, and partial clearing.
– Expected changes to surface water flows into native vegetation are minimal due to the installation of drainage control engineering structures, as presented in section 4.9.5.1 and Appendix A12. The table drains have been designed to capture and infiltrate surface water runoff for a 1 in 100 Average Recurrence Interval (ARI). This ensures only rare rainfall events will result in discharge to vegetation.

4.7.5.3 Summary of impacts

The direct and indirect impacts to flora and vegetation associated with the Proposal are unlikely to be significant. This is because:

– Less than 2% of the *Eucalyptus* open woodland on Cockatoo Island will be directly impacted
– No vegetation types recorded as ‘other significant vegetation’ will be directly impacted
– Up to 12% of the total known individuals of *Triodia* sp. Hidden Island will be cleared.

4.7.6 Cumulative Impact Assessment

Previous operations across Cockatoo Island have cleared approximately 109 ha of native vegetation, which remains cleared (Table 4.30). Based on the 2024 Mining Proposal submitted by Cockatoo Mining Pty Ltd, there is no further vegetation clearing proposed associated with the mine recommencement (Cockatoo Island Mining Pty Ltd 2024). There is also no additional development proposed on the adjacent Irvine Island. The Proposal intends to clear an additional 7.37 ha, representing 1.61% of the Island area. Given the small extent of proposed clearing with respect to the remaining vegetation present, the Proposal is not expected to have a significant cumulative impact on the extent of native vegetation across the island.

Table 4.30 Cumulative impacts to flora and vegetation within the Proposal

Type	Proposal	Cockatoo Island (previous and current clearing)	Total post Proposal approval
	Kimberley Supply Chain Cluster	**Iron Ore Mine**	
Total native vegetation proposed to be cleared	7.37 ha (1.61% of the total island area)	109 ha (21.96% of the total island area)	**116.37 ha** (23.58% of the total island area)
Conservation significant flora affected	145 (12% of the population within Cockatoo Island)	None recorded within cleared areas	**1026 individuals**
Conservation significant vegetation communities	nil proposed to be cleared	None recorded within cleared areas	**nil**

4.7.7 Mitigation

A Construction environmental management plan (CEMP) and operational environmental management plan (OEMP) have been prepared to manage and mitigate potential impact as a result of the construction and operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.31 below.

Table 4.31 Proposed mitigation measures for flora and vegetation

Potential Impact	Proposed mitigation			
	Avoid	Minimise	Rehabilitate	Significant Residual Impact?
Direct impacts: Loss of vegetation due to clearing Clearing will remove up to 7.34 ha of native vegetation	– The proposed clearing has been located within areas of highly degraded vegetation, avoiding clearing in undisturbed areas.	– Vegetation clearing shall be kept to the minimum amount required – Survey and clearly demarcate clearing areas prior to clearing commencing, including flagging and signage. – Observers and spotters will be used when working near sensitive sites, e.g., when clearing boundaries may not be readily visible (for example due to dense vegetation). I – Induct relevant personnel and contractors on land disturbance and vegetation clearing management including: • Key protection measures being implemented; • “no-go” areas; • Clearing boundaries	n/a – No temporary disturbance is required.	No
Indirect impact: Fragmentation of vegetation as a result of clearing	– The proposed clearing will not created islands of vegetation, separated from existing remnants.	– Vegetation clearing shall be kept to the minimum amount required.	n/a – No temporary disturbance is required.	No
Indirect impact: Degradation of vegetation as a result of altered surface water flows.	– The Proposal has been redesigned to avoid and/or minimise interactions with, and disturbance to, watercourses, riparian vegetation and flood plains. – Proposed engineering controls and water management structures will be installed to ensure natural hydrological regimes are maintained.	– Water management structures will be designed to minimise the degradation of water quality by sedimentation, erosion or chemical pollutants.	n/a	No
Indirect Impact: Degradation of vegetation due to the introduction and/or spread of weeds.	– The Proponent will implement strict hygiene procedures to prevent spread of current weeds, introduction of new or additional populations of weed species.	– Weed and hygiene control measures will be implemented within the DE and areas around the clearing front, including the inspection of all vehicles and machinery prior to entering or exiting the site during construction and operation. – The Proponent will undertake a baseline weed survey of the Proposed clearing area, and within a 100 m buffer prior to construction to determine species presence, extent and cover. – Weed monitoring will be undertaken annually during construction and two years post-construction following the wet season. – The Proponent will develop a weed management procedure with particular focus on Declared Pests and WoNS following establishment of baseline weed presence, to ensure that weed species’ extent and cover do not increase compared to baseline. The procedure will include: • Management of clearing activities, • Frequency and type of weed control (spraying and/or manual removal) • and monitoring; • Establishment of reference sites; and • Potential thresholds criterion and contingency measures.	n/a	No
Indirect impact: degradation of vegetation as a result of dust deposition	– Vegetation clearing and earthworks during high winds (>40 km/hr) will be avoided.	The Proponent will implement dust controls including: – Avoid any high dust emission works during high wind (e.g., vegetation clearing) and implement additional use of dust management measures (such as water carts and misting sprays) where these works are not avoidable. – Implement dust suppression measures including utilising water carts and misting sprays on unsealed roads and access tracks, cleared areas and at locations of high dust risk during construction. Measures will be implemented where dust is visible and based on predicted meteorological conditions.	n/a	No

4.7.8 Predicted outcomes

The outcomes of the Proposal will:

– Disturbance 7.37 ha (permanent) of native vegetation
– Not detrimentally impact adjacent native vegetation following construction
– No impact any flora of conservation significance.

4.8 Key environmental factor – terrestrial fauna

4.8.1 EPA objective

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

4.8.2 Policy and guidance

– Environmental Factor Guideline – Terrestrial Fauna (EPA 2016f)
– Technical Guidance – Terrestrial fauna surveys (EPA 2016e)
– Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016c)
– Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA 2016d).

4.8.3 Receiving environment

Baseline studies relevant to the Proposal area are provided in Table 4.32.

Table 4.32 Baseline studies – terrestrial fauna

Consultant	Survey Name
ecologia (2025)	Kimberley Supply Chain Cluster. Targeted Fauna And Flora Survey
Aprasia Wildlife (2009) – Appendix A8	Fauna Assessment of Cockatoo Island (Desktop Review)
GHD (2014) – Appendix A9	Cockatoo Island Flora, Fauna and SRE Surveys
GHD (2017a) – Appendix A10	Cockatoo Island Multi-User Supply Base. Technical Study - Terrestrial Flora and Fauna
Warham (1957) – Appendix A11	Cockatoo Island Birds

Vertebrate fauna habitats

A survey area surrounding the Proposal was assessed for fauna over a number of visits.

Fauna habitat within the survey area is dominated by woodland (with rocky ridgelines and exposed rocky areas) and regrowth shrubland (Figure 4.14). Much of the woodland habitat was burnt in May 2016 and provides little cover for fauna species in its current condition. The rocky nature of the area does provide some refugia however, this would be limited to use by rock dwelling species. Due to the heat of the fire, many of the large trees on the Island have been burnt and large hollows have been lost. Small areas of vineland and woodland mosaic habitat were recorded in valleys; however these patches were considered to be too small to support any fauna specific to this habitat type.

There are no permanent waterbodies within the survey area, however seasonal pooling occurs around small rocky areas and the historic tailings dam. Minor drainage lines occur within gullies bisecting the survey area that transport surface water runoff following seasonal rainfall events.

Large portions of Cockatoo Island (approximately 117 ha) have been cleared or highly disturbed through mining, the air strip, roads and other infrastructure. Approximately 18.43 ha (35%) within the proposed disturbance area is Degraded to Completely Degraded (Table 4.27).

Vertebrate fauna assemblages

Previous fauna surveys on Cockatoo Island have recorded 177 species on and near the Island, including five mammals, 13 reptiles, 157 birds and two amphibian species.

Conservation significant vertebrate fauna

Five conservation significant terrestrial fauna species have been recorded from Cockatoo Island. Details of these species and their State and Commonwealth conservation status are included in Table 4.33.

The habitat in its current form would support few conservation significant species however, opportunistic use for foraging may occur.

Migratory species

Three species listed as Migratory under the EPBC Act and/or under Schedule 5 of the WC Act were recorded from the survey area during the surveys. These included:

– Eastern Osprey (Pandion cristatus)
– Lesser Frigatebird (Fregata ariel)
– Common Sandpiper (Tinga hypoleucos).

These species were observed flying over the survey area, are considered highly mobile and would opportunistically utilise the survey area for foraging.

Introduced fauna

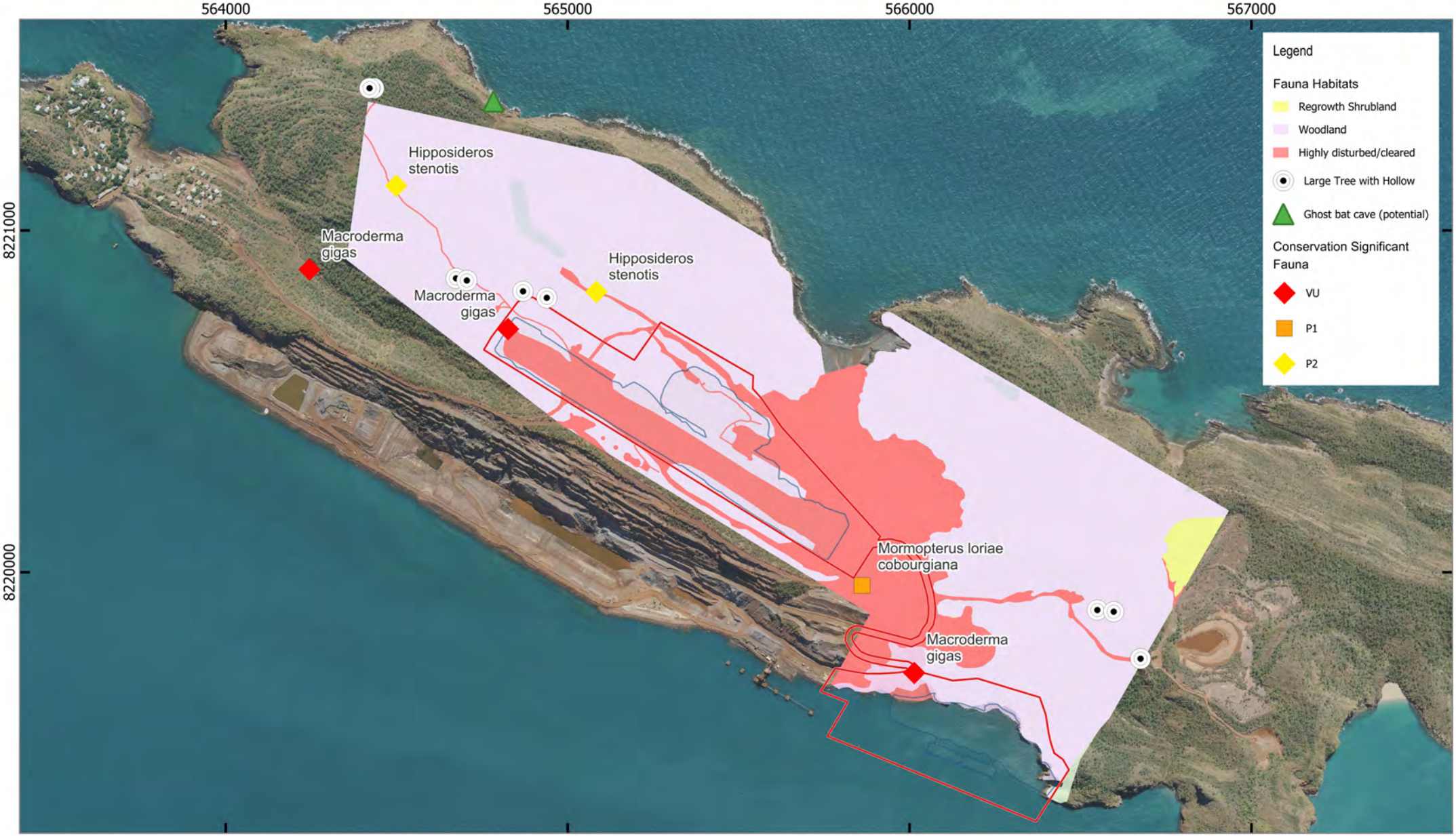
Three introduced species have historically been recorded from Cockatoo Island, including the domestic cat, goat and Asian House Gecko. Domestic cats and goats were previously known to occur on the Island however anecdotal evidence suggests that they have not been seen on the Island since the 1980s. The Asian House Gecko (*Hemidactylus frenatus*) continues to occur on the Island and is predominantly found around the townsite.

Short range endemic invertebrates

Baseline surveys on Cockatoo Island identified 22 invertebrate species from 12 families and five classes (Table 4.34).

Taxonomic assessment indicates that none of the recorded species represented confirmed SRE species, however three likely and 15 potential SRE species have been recorded. The remaining four species are known to have a widespread distribution and therefore have no SRE status.

The bushfire event that occurred across much of the northern part of Cockatoo Island in early 2016 has temporarily reduced the value of the SRE habitat within the Proposal area. However, a site visit in May 2017 showed dense regrowth of understorey species in most of the burnt areas, with the Woodland habitat likely to support assemblages of invertebrate species across Cockatoo Island (GHD 2017a).



Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Mercator Auxillary Sphere
Horizontal Datum: GDA 1994
Grid: MGA Zone 51

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GHD

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Cockatoo Island Multi-User Supply Base

Fauna Habitats and Conservation Significant Fauna Locations

Project No. **12526793**
Revision No. **E**
Date. **28/03/2025**

FIGURE 4-14

Document Path:
Print Date: 28 March 2025

Data Source:WANow
Created By: Tristan Sleigh

Table 4.33 Conservation significant fauna known to occur on Cockatoo Island

Species	WC Act Ranking	EPBC Ranking	Occurrence within the Proposal area
Masked Owl (northern sub-species) (*Tyto novaehollandiae kimberli*)	Priority 1	Vulnerable	Previously recorded in woodland habitat on the eastern side of Cockatoo Island. In its current form the woodland habitat within the survey area may provide some foraging habitat. Nine trees with large hollows that may be used by this species have been recorded from the survey area, outside of the DE, however there was no evidence of existing or historical use (GHD 2017a). The targeted fauna survey conducted in February 2025 (ecologia 2025) did not record evidence of this species; however, this does not indicate an absence of this species from the DE.
Ghost Bat (*Macroderma gigas*)	Vulnerable	Vulnerable	Ghost bats have previously been recorded on Cockatoo Island on one occasion via echolocation. This species is known to occur on nearby Koolan Island and other Islands throughout the Buccaneer Archipelago. The occurrence of the species on Cockatoo Island indicates that there is likely to be a significant refuge for the species in close proximity to both Koolan and Cockatoo Islands. (GHD 2017a) No Ghost Bat roosts or maternity caves have been recorded from the survey area. One potentially suitable cave is present in the rocky coastal cliffs approximately 100 m from the north-west boundary of the survey area. (GHD 2017a) It is unknown if this cave is affected by the tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species. Remnant vegetation on the island demonstrated a diverse amount of small fauna species (i.e. birds, insects, reptiles, mammals and amphibians) a significant feature of Ghost Bat foraging areas. The island is likely an important and valuable feeding ground for the species however this may decrease where the habitats are degraded or have been historically disturbed. (GHD 2017a). The targeted fauna survey conducted in February (ecologia 2025) confirmed the presence of this species from two locations within the DE.
Little North-western Mastiff Bat (*Mormopterus loriae cobourgiana*)	Priority 1		Within its distribution, the Little North-western Mastiff Bat is restricted to localised habitats, typically occupying mangrove stands. The extent of mangrove areas on Cockatoo Island is minimal and there are no mangroves within the survey area. (GHD 2017a) It is likely that this species roosts in mangroves on nearby Islands or on the mainland, however; may utilise the survey area for opportunistic foraging. It is likely that Cockatoo Island forms part of a feeding corridor from Koolan Island to Irvine Islands to where much larger stands of Mangrove are present. The remnant vegetation present on the island is likely locally important for the species; however degraded areas are likely of little foraging significance, and these are not present within the DE. (GHD 2017a)
Northern Leaf-nosed Bat (*Hipposideros stenotus*)	Priority 2		The Northern Leaf-nosed Bat has been recorded on Cockatoo Island along with nearby Koolan Island, Irvine Island and Bathurst Island. (GHD 2017a) This species occurs within a variety of habitats and typically roosts in shallow cracks, caves, boulder piles and disused mines. No small caves and limited rocky

Species	WC Act Ranking	EPBC Ranking	Occurrence within the Proposal area
			crevices suitable for breeding for this species have been recorded from the survey area however, it is likely to utilise the survey area for foraging. (GHD 2017a) It is likely that Cockatoo Island forms part of a feeding corridor from Koolan Island to Irvine Islands to where much larger stands of remnant vegetation is present. This species may utilise the areas of remnant vegetation for foraging but is unlikely to be only utilised in the region. The remnant vegetation present on the island is likely locally important for the species however degraded areas are likely of little foraging significance. (GHD 2017a)
Water Rat (*Hydromys chrysogaster*)	Priority 4		The Water Rat has been recorded from Cockatoo Island, Irvine Island, Margaret Island and other Kimberley Islands to the north. This species typically occurs in permanent fresh or brackish water but can also be found in marine environments, mangroves and sheltered beaches. (GHD 2017a) It is likely that the population of Water Rats on Cockatoo Island utilise the coastal areas, including the coastal margins of the survey area (Figure 4-10). (GHD 2017a)

Table 4.34 Invertebrate species recorded within the survey area

Species	SRE Status
Gastropoda: Camaenidae: *Kimboraga* cf. *yampiensis*	Potential SRE
Gastropoda: Camaenidae: *Torresitrachia* aff. *bathurstensis*	Potential SRE
Gastropoda: Helicarionidae: *Westracystis lissus*	Widespread
Crustacea: Isopoda: Armadillidae: *Buddelundia* '82'	Likely SRE
Crustacea: Isopoda: Philosciidae: *Philosciidae* ‘cockatoo Island'	Likely SRE
Crustacea: Isopoda: Philosciidae sp. indet.	Likely SRE
Chilopoda: Geophilida: Chilenophilidae	Potential SRE
Chilopoda: Geophilida: Mecistocephalidae	Potential SRE
Chilopoda: Scolopendrida: Cryptopidae: *Cryptops* sp.	Potential SRE
Chilopoda: Scolopendrida: Scolopendridae: *Rhysida polyacantha*	Widespread
Chilopoda: Scolopendrida: Scolopendridae: *Scolopendra laeta*	Widespread
Chilopoda: Scolopendrida: Scolopendridae: Scolopendridae genus indet. sp.	Potential SRE
Chilopoda: Scutigerida: Scutigeridae: genus indet. sp.	Potential SRE
Chilopoda: Scutigerida: Scutigeridae: *Parascutigera*? sp.	Potential SRE
Chilopoda: Scutigerida: Scutigeridae: *Thereuopoda* sp.	Potential SRE
Diplopoda: Polydesmida: Paradoxosomatidae: genus indet. (juvenile) and sp. indet. (juvenile)	Potential SRE
Arachnida: Pseudoscorpiones: Olpiidae: *Xenolpium* sp.	Potential SRE
Arachnida: Scorpiones: Buthidae: *Lychas bituberculatus* Pocock, 1891	Widespread
Possibly juvenile Arachnida: Araneae: Barychelidae: *Synothele* sp. juv.	Potential SRE
Arachnida: Araneae: Ctenzidiae: *Conothele* sp. female	Potential SRE
Arachnida: Acari: Trombidioidea: *Trombidioidea*	Potential SRE
Arachnida: Opiliones: Assamiidae: *Dampetrus*?	Potential SRE

4.8.3.1 Adequacy of survey

The survey (GHD 2017a) undertaken across the project area was undertaken in accordance with EPA Environmental Factor Guidance – Terrestrial Fauna (EPA 2016f), EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016c) and EPA Technical Guidance – Terrestrial fauna surveys (EPA 2016e). This survey built on the data results collected during the previous survey in 2013 (GHD 2014).

The survey undertaken in December 2016 (GHD 2017a), provides data and results that were, at the time of referral of this project (2017), within the suggested 5-year post survey period, ensuring result validity. At the time of submission of the document, the survey results are approximately eight years old, and the results presented are outside of the recommended survey age for impact assessment. The additional targeted fauna survey undertaken in February 2025 (ecologia 2025; Appendix A) was conducted within the proposed DE to provide an updated census of conservation significant fauna species with potential to be impacted by the proposal. On review of the reports, the results and data presented are adequate to inform impact assessment due to the following:

– Updated database searches have indicated that no additional conservation significant fauna species are likely to occur within the project area
– No additional impacts have been identified within the survey area since the assessment was undertaken and as such the current quality and composition of the fauna habitats are expected to be consistent with the mapping provided in the 2017 GHD report.
– No clearing had been undertaken across Cockatoo Island since the 2013 survey was undertaken, which described the extent of fauna habitats across the entirety of the Island, providing local context to impacts.

– Updated targeted survey was conducted during the appropriate season and provides a temporal update of the extent of conservation significant fauna species within the DE.

4.8.4 Potential impacts

Construction phase impacts

Direct clearing and loss of habitat

Construction of the Proposal will result in clearing of 7.37 ha of native vegetation and associated fauna habitat, including the following habitat for conservation significant fauna:

– 7.37 ha of the potential foraging and low value breeding habitat for the Masked Owl (northern sub-species)
– 7.37 ha of potential foraging/hunting habitat for bat species – Ghost Bat, Little North-western Mastiff Bat and Northern Leaf-nosed Bat
– Less than 0.1 ha of potential coastal habitat for the Water Rat.
– 7.37 ha of habitat for potential SRE invertebrate species.

GHD (2014) reported that the woodland fauna foraging habitat occurs over 65% of the Island, totalling 340 ha. Over 90% of this vegetation type will remain following clearing.

Potential impacts associated with vegetation clearing include:

– Loss of up to 2% of potential foraging habitat on the Island for some conservation significant fauna
– Loss of up to 2% of habitat for likely or potential SRE species
– Death or displacement of fauna species – clearing and construction works may result in the injury or death of fauna
– Fragmentation of habitat – vegetation clearing is unlikely reduce the overall connectivity of the habitat available to fauna on the Island, given the proposed clearing is confined to already fragmented vegetation, and it will not cause any additional areas of fragmentation.

The significance of impacts to conservation significant fauna habitat is discussed below.

Ghost Bat

As described in Table 4.33, the woodland habitat proposed to be cleared potentially forms part of an important foraging resource for the Ghost Bat (GHD 2017a). The woodland habitat within the proposed clearing area forms part of a total of 340 ha of woodland fauna foraging habitat, of which the Ghost bat is likely to utilise opportunistically.

The Kimberley colonies contain approximately two-thirds of Western Australia's Ghost Bat populations and are likely to be relatively stable as little mining or habitat destruction occurs in the region (TTSC 2016a). The estimated current population size of the species in the Kimberley is 3,000-4,000 individuals (McKenzie and Hall, 2008). During McKenzie and Bullen's (2012) survey of the Kimberley islands from King Sound in the south-west to Cambridge Gulf on its eastern edge, they noted the Ghost Bat appeared to be widespread and common. The species was observed on five islands and detected via calls on six others; including Angustus, Sir Graham Moore, Storr, Boongaree, Coronation, Koolan, Kingfisher, St Andrew and NW Molema islands.

The removal of the 7.37 ha of foraging habitat is not considered to significantly impact populations of the Ghost Bat, due to the availability of potential habitat in proximity to the Proposal (local scale) and the wider Kimberley region and small extent of removal compared to the extent of available habitat throughout the species range.

Little North-western Mastiff Bat

As described in Table 4.33, this species is likely to utilise the woodland habitat proposed to be cleared for opportunistic foraging. This species is typically restricted to mangrove stands, with foraging in nearby woodland habitats (GHD 2017a). While the woodland habit present across Cockatoo Island is likely to be locally important for the species, the small extent of mangroves on the island, indicate that the extent of woodland habitat is unlikely to be the limiting factor for this species. The woodland habitat is also likely to form part of a feeding corridor from Koolan Island to Irvine Islands to where much larger stands of Mangrove are present. The proposed clearing will

not cause fragmentation of this corridor, given the retention of 98% of the woodland habitat currently present on Cockatoo Island. Given the removal of 7.37 ha of foraging habitat represents a reduction of 2% of the available foraging habitat on the Island, the clearing is unlikely to significantly impact populations of the Little North-western Mastiff Bat.

Northern Leaf-nosed Bat

As described in Table 4.33, this species is likely to utilise the woodland habitat proposed to be cleared for foraging (GHD 2017a). The woodland habitat within the proposed clearing area forms part of a total of 340 ha of woodland fauna foraging habitat, of which the Ghost bat is likely to utilise opportunistically. This habitat is also likely to form part of a feeding corridor from Koolan Island to Irvine Islands. The proposed clearing will not cause fragmentation of this corridor, given the retention of 98% of the woodland habitat currently present on Cockatoo Island. Given the removal of 7.37 ha of foraging habitat represents a reduction of 2% of the available foraging habitat on the Island, the clearing is unlikely to significantly impact populations of the Northern Leaf-nosed Bat.

Masked Owl (northern sub-species)

As described in Table 4.33, this species is likely to utilise the woodland habitat proposed to be cleared for foraging. The woodland habitat also has the potential to support breeding (GHD 2017a). The woodland habitat within the proposed clearing area forms part of a total of 340 ha of woodland fauna foraging habitat, and potential breeding habitat. Suitable habitat is available on Koolan and Irvine Islands, and the species has previously been recorded on Koolan Island (GHD 2017a).

The northern sub-species of the Masked Owl has previously been recorded adjacent to the Proposal area on Cockatoo Island and there is suitable foraging habitat but limited potential breeding habitat present. The distribution of the Masked Owl (northern) is very poorly known, and three sub- populations have been suggested, the Kimberley, Northern Territory and Cape York (Garnett et al. 2011). There are very few (approximately five) records of the northern sub-species of the Masked Owl in the Kimberley region, between Yampi Sound in the north-east to Cambridge Gulf, including Windjana Gorge and Augustus Island (DPaW 2007). There are also historical records from near Broome (Crossman 1910).

A review of aerial photography of Cockatoo Island and other surrounding islands (e.g. Koolan, Bathurst and Irvine Islands) suggests that the extent of potential habitat for the species is likely to be well-represented in the local area. In addition, one Beard (1977) vegetation association (association 8001) mapped within the Proposal area partially aligns with the Masked Owl habitat (woodland) recorded during the survey. The extents of the vegetation associations have been determined by the State-wide vegetation remaining extent calculations (Current as of June 2018 (latest update May 2018) – GoWA 2019). The current extents of vegetation associations remaining are greater than 85 % of the pre-European extent at all scales (e.g. State, IBRA Bioregion, IBRA Sub-region and LGA) (GHD 2017a). It is difficult to estimate the extent of the types of suitable habitat within the vegetation associations (e.g. the extent breeding habitat) however it is reasonable to assume that the extent of similar potentially suitable habitats within the locality is well represented.

Both Koolan and Irvine Islands are located within flying distance for the Masked Owl, and it is unlikely that the loss 7.37 ha of potential habitat would substantially reduce the area of habitat available to the species or result in a long-term decrease in the size of the Kimberley population of the species.

Water Rat

As described in Table 4.33, this species is likely to utilise the coastal habitat present within the proposed DE. This species is known from the nearby Irvine Island, Margaret Island and other Kimberley Islands to the north (GHD 2017a). Habitat for this species occurs throughout the coastal areas of Cockatoo Island, and it is unlikely that the loss of 0.1 ha of potential habitat would substantially reduce the area of habitat available to the species or result in a long-term decrease in the size of the Kimberley population of the species.

Potential SRE species

As described in section 4.8.3, the woodland habitat proposed to be cleared potentially forms habitat for 18 potential SRE invertebrate species (GHD 2017a). The woodland habitat within the proposed clearing area forms part of a total of 340 ha of woodland habitat, of which is likely to support assemblages of the same invertebrate species across the island. The removal of the 7.37 ha (2.2%) of supporting habitat is not considered to significantly

impact populations of potential SRE invertebrate species due to the availability of potential habitat in proximity to the Proposal (local scale) within Cockatoo Island.

Noise, vibration, light and dust

During the construction phase, there will be a temporary increase in secondary impacts such as noise, vibration, light and dust. Increased noise, vibration and dust will temporarily result in fauna avoiding the area; however, is unlikely to have a permanent impact on fauna species on the Island.

Operational phase impacts

Vehicle strike

Operation of the Supply Base will result in an increase to vehicle movements on the Island. Previous mining activities involved frequent vehicle movements throughout the Island. Operational activities associated with the Supply Base may increase the risk of fauna strike, however it will not introduce any new impacts.

Noise and vibration

During peak times there could be over fifteen flights servicing the Island per week. Noise and vibration associated with helicopter and aircraft movements have the potential to result in short-term disturbance to fauna on a local scale. An airstrip has been operational on the Island for several decades servicing the mine. Operational activities associated with aircraft servicing the Supply Base will result in an incremental increase in potential noise impacts to fauna, however it will not introduce any new impacts.

Routine scheduled flights will operate during daylight hours, although aircraft movements may occur at night during emergencies, such as medical evacuations.

4.8.5 Assessment of impacts

The direct and indirect impacts associated with the Proposal are unlikely to have a significant impact on terrestrial fauna given:

– The relatively limited extent of foraging habitat loss
– The presence of extensive habitat for bat and large bird species on adjacent Islands and the mainland.

4.8.6 Mitigation

A Construction environmental management plan (CEMP) and operational environmental management plan (OEMP) have been prepared to manage and mitigate potential impact as a result of the construction and operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.35 below.

Table 4.35 Proposed mitigation measures for terrestrial fauna

Potential Impact	Proposed mitigation			
	Avoid	Minimise	Rehabilitate	Significant Residual Impact?
Loss of fauna habitat due to clearing activities: Clearing up to 7.34ha of fauna habitat	– The proposed clearing has been minimised as far as practicable to reduce the extent of clearing required.	– Clearing shall be kept to the minimum amount required. – Survey and clearly demarcate clearing areas prior to clearing commencing, including flagging and signage. – Observers and spotters will be used when working near sensitive sites, e.g., when clearing boundaries may not be readily visible (for example due to dense vegetation). I – Induct relevant personnel and contractors on land disturbance and vegetation clearing management including: • Key protection measures being implemented; • “no-go” areas; • Clearing boundaries.	n/a – No temporary disturbance is required.	No
Fragmentation of fauna habitats	– The proposed clearing has been minimised as far as practicable to reduce the extent of clearing required and designed so as not to create a break in the contiguous vegetation remaining.	– Vegetation clearing shall be kept to the minimum amount required.	n/a – No temporary disturbance is required.	No
Fauna strike	– The proposed clearing has been designed to avoid significant habitats.	– Construction vehicle movements, including clearing activities, will occur during daylight, which will minimise interactions with nocturnal species – Clearing will be undertaken progressively in one direction, to allow fauna to disperse to other habitats. – Clearing will commence, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). – Vehicles, plant, and machinery not required for clearing activities will be restricted to designated roads/access tracks and cleared areas.	n/a	No
Habitat degradation or species disturbance due to increased dust, noise, vibration or light	– The proposed clearing has been designed to avoid significant habitats.	The Proponent will implement dust controls including: – Avoid any high dust emission works during high wind (e.g., vegetation clearing) and implement additional use of dust management measures (such as water carts and misting sprays) where these works are not avoidable. – Implement dust suppression measures including utilising water carts and misting sprays on unsealed roads and access tracks, cleared areas and at locations of high dust risk during construction. Measures will be implemented where dust is visible and based on predicted meteorological conditions. Management actions to manage noise, vibration and light emissions include: – Lighting will be designed to minimise intensity and duration; – Adapt lighting including colour, intensity and timing, including smart control options (i.e., switching off, dimming or flashing); – Lighting will be directed inwards towards the Haul Road to minimise light impacts; – Automatic sensors will be installed on plant and machinery to avoid unnecessary lighting at night; – Clearing activities will be limited to daylight hours to reduce impacts of noise, vibration and light on nocturnal foraging;	n/a	No
Habitat degradation due to erosion, sedimentation or altered hydrological regimes	– The Proposal has been redesigned to avoid and/or minimise interactions with, and disturbance to, watercourses, riparian vegetation and flood plains. – Proposed engineering controls and water management structures will be installed to ensure natural hydrological regimes are maintained.	– Water management structures will be designed to minimise the degradation of water quality by sedimentation, erosion or chemical pollutants.	n/a	No
Habitat degradation due to introduction or spread of weeds,	– The Proponent will implement strict hygiene procedures to prevent spread of current weeds, introduction of new or additional populations of weed species.	– Weed and hygiene control measures will be implemented within the DE and areas around the clearing front, including the inspection of all vehicles and machinery prior to entering or exiting the site during construction and operation. – The Proponent will undertake a baseline weed survey of the Proposed clearing area, and within a 100 m buffer prior to construction to determine species presence, extent and cover. – Weed monitoring will be undertaken annually during construction and two years post-construction following the wet season.	n/a	No

Potential Impact	Proposed mitigation			
	Avoid	Minimise	Rehabilitate	Significant Residual Impact?
		– The Proponent will develop a weed management procedure with particular focus on Declared Pests and WoNS following establishment of baseline weed presence, to ensure that weed species' extent and cover do not increase compared to baseline. The procedure will include: • Management of clearing activities, • Frequency and type of weed control (spraying and/or manual removal) • and monitoring; • Establishment of reference sites; and – Potential thresholds criterion and contingency measures.		

4.8.7 Cumulative Impact Assessment

Previous operations across Cockatoo Island have cleared approximately 109 ha of Eucalypt woodland, which remains cleared (Table 4.36). Based on the 2024 Mining Proposal submitted by Cockatoo Mining Pty Ltd, there is no further vegetation clearing proposed associated with the mine recommencement (Cockatoo Island Mining Pty Ltd 2024). There is also no additional development proposed on the adjacent Irvine Island. The Proposal intends to clear an additional 7.37 ha, representing 1.61% of the Island area. Given the small extent of proposed clearing with respect to the remaining vegetation present, the Proposal is not expected to have a significant cumulative impact on the availability of fauna habitat across the island.

Table 4.36 Cumulative impacts to fauna habitat within the Proposal

Type	Proposal	Cockatoo Island (previous and current clearing)	Total post Proposal approval
	Kimberley Supply Chain Cluster	**Iron Ore Mine**	
Total Eucalypt woodland proposed to be cleared	7.37 ha (1.61% of the total island area)	109 ha (21.96% of the total island area)	**116.37 ha** (23.58% of the total island area)

4.8.8 Predicted outcomes

The Proposal will result the loss of up to 7.37 ha of habitat for fauna, including foraging habitat suitable for some conservation significant species.

Some direct loss of reptile and SRE fauna may occur because of vegetation clearing and ground disturbance but this is unlikely to affect conservation significant species as most are nocturnal and arboreal and can move away from the disturbance area.

The availability of other suitable habitat on Cockatoo Island and on adjacent islands and the mainland is likely to ensure the survival and continued presence of the conservation significant species recorded.

Potential operational impacts are unlikely to significantly affect fauna presence or diversity.

4.9 Key environmental factor – terrestrial environmental quality

4.9.1 EPA objective

To maintain the quality of land and soils so that environmental values are protected.

4.9.2 Policy and guidance

– Statement of Environmental Principles, Factors and Objectives (EPA, 2020a);
– Environmental Protection Authority (EPA 2016m) Environmental Factor Guideline Terrestrial Environmental Quality.

4.9.3 Receiving environment

Baseline studies relevant to the Proposal are provided in Table 4.37.

Table 4.37 Baseline studies – terrestrial environmental quality

Consultant	Study Name
GHD (2025c) – Appendix A14	February 2025 Indicative Preliminary Contamination Survey of Reclamation Fill

For the purpose of EIA, the EPA defines Terrestrial Environmental Quality as 'the chemical, physical, biological and aesthetic characteristics of soils' (EPA 2016m).

The Kimberley region has been surveyed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Western Australian Department of Agriculture and Food (DAFWA), DPaW and Landgate for the purposes of land classification, mapping and resource evaluation. One hundred and eleven land systems have been described for the region, which are distinguished on the basis of topography, geology, soils and vegetation (Payne and Schoknecht 2011). The Proposal is located within the Precipice land system (Table 4.38). The likelihood of Acid Sulfate Soils (ASS) is considered low throughout the proposal area.

Table 4.38 Details of Precipice land system found in the Proposal (Payne & Schokencht 2011)

Land System	Description	Geology	Geomorphology	Soils
Precipice	Occupies 7,530 km2 and comprises rocky mountainous sandstone country with narrow or restricted basalt valleys, low open woodlands with curly spinifex.	Upper Proterozoic, gently dipping and folded quartzite, sandstone, and shale, with basalt and dolerite flows and intrusions of Upper Proterozoic or Lower Cambrian age.	Formed by dissection of the Kimberley surface - plateaux and mountain ranges: extensive, high plateaux, cuestas, and upstanding mountain summits in strike belts up to 40 km wide, with steep escarpments and upper slopes and restricted lower slopes; basalt and dolerite hills in valley floors; moderately dense, rectangular pattern of narrow, incised valleys; relief up to 530 m.	Rocky quartzite plateaux and mountain ranges also narrow basalt valleys

The Proposal lies within a registered contaminated site (ID No. 18738). The nature and extent of contamination, as detailed within the Basic Summary of Records report states:

'Contamination including hydrocarbons (such as from diesel or oil), metals, organometallic compounds (such as the marine anti-fouling agent Tri-butyl tin), polycyclic aromatic hydrocarbons (PAHs), ammonia and asbestos have been identified at a number of sites across the island.'

The current restriction on use are commercial/industrial use which excludes sensitive uses with accessible soil. A site management plan including remediation measures has been developed for the site and will be implemented as part of mine closure activities.

4.9.4 Potential Impacts

Construction phase impacts

– Contamination of soils from construction activities associated with storage of chemicals and potential spills.

Operations phase impacts

– Contamination of soils from operation activities associated with storage of chemicals and potential spills.
– Erosion of soils and mobilisation of potential contaminants throughout the Proposal area.

4.9.5 Assessment of Impacts

The proposed activities are unlikely to have a significant impact on Terrestrial Environmental Quality based on the following:

– Effective drainage design to prevent erosion of soils and mobilisation of potential contaminants throughout the Proposal area
– Effective management of hydrocarbon handling and storage.

4.9.5.1 Drainage design

Drainage systems in the apron and surrounding areas will provide the capacity required to manage stormwater and prevent water accumulation, ensuring safe operation of the facility. Drainage from the airfield will be directed to table drains for infiltration on site. These will be designed and constructed to capture and infiltrate surface water runoff for a 1 in 100 Average Recurrence Interval (ARI) (which roughly corresponds to a 1% Annual Exceedance Probability (AEP)) preventing the mobilisation of contaminants. The typical Table drain design is illustrated in Figure 4.15.

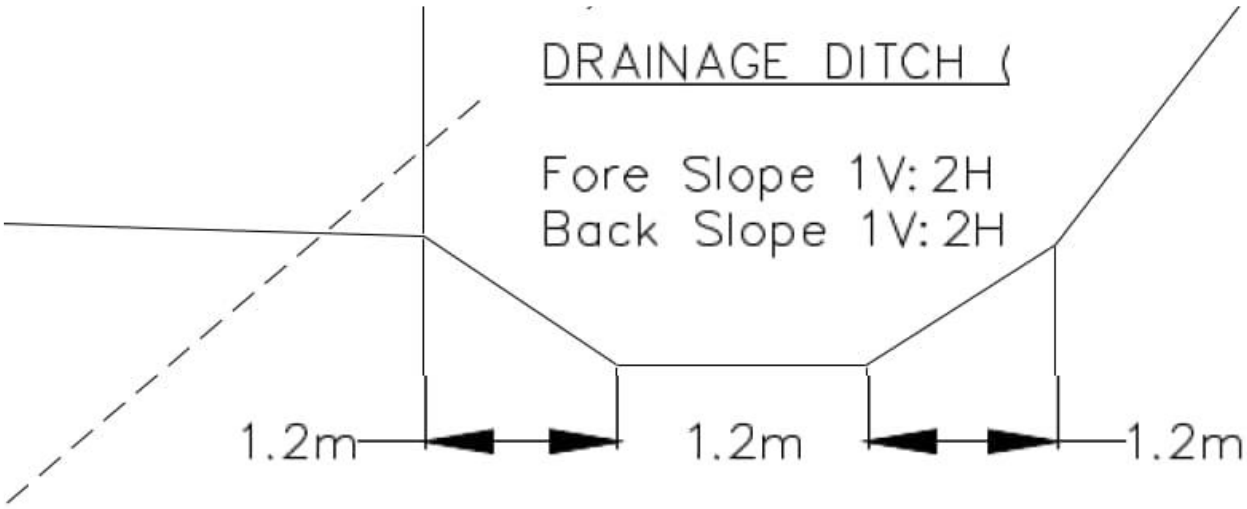

Figure 4.15 Table Drain Typical Detail

Oil/Water separators shall be used to treat apron runoff unless otherwise approved by the Company. Drainage from the airfield will be directed to table drains for infiltration on site. Drainage systems shall incorporate features that minimise or eliminate the discharge of hydrocarbons and other pollutants to protect local ecosystems.

Where installed along taxiways and runways, drainage inlets shall be placed at intervals sufficient to prevent water pooling, ensuring that water is efficiently directed away from the pavement surface. Where installed near the aircraft parking apron, drainage systems shall be designed to accommodate the high-intensity flows associated with fuel spill containment, with appropriate treatment systems in place. Drainage systems in all areas shall be powered by gravity flow or appropriate pumps where necessary to ensure effective water removal. The concept drainage design is illustrated in Figure 4.16 and the concept design report is provided in Appendix A.

The access track drainage system will direct stormwater to table drains and prevent erosion. Cross drains or culverts will be placed at key intervals to control water flow and maintain track stability. Erosion control measures, such as rock armouring or vegetative lining, will be used where necessary. Regular (weekly) monitoring and maintenance of the drainage infrastructure will be carried out during both the construction and operational phases.

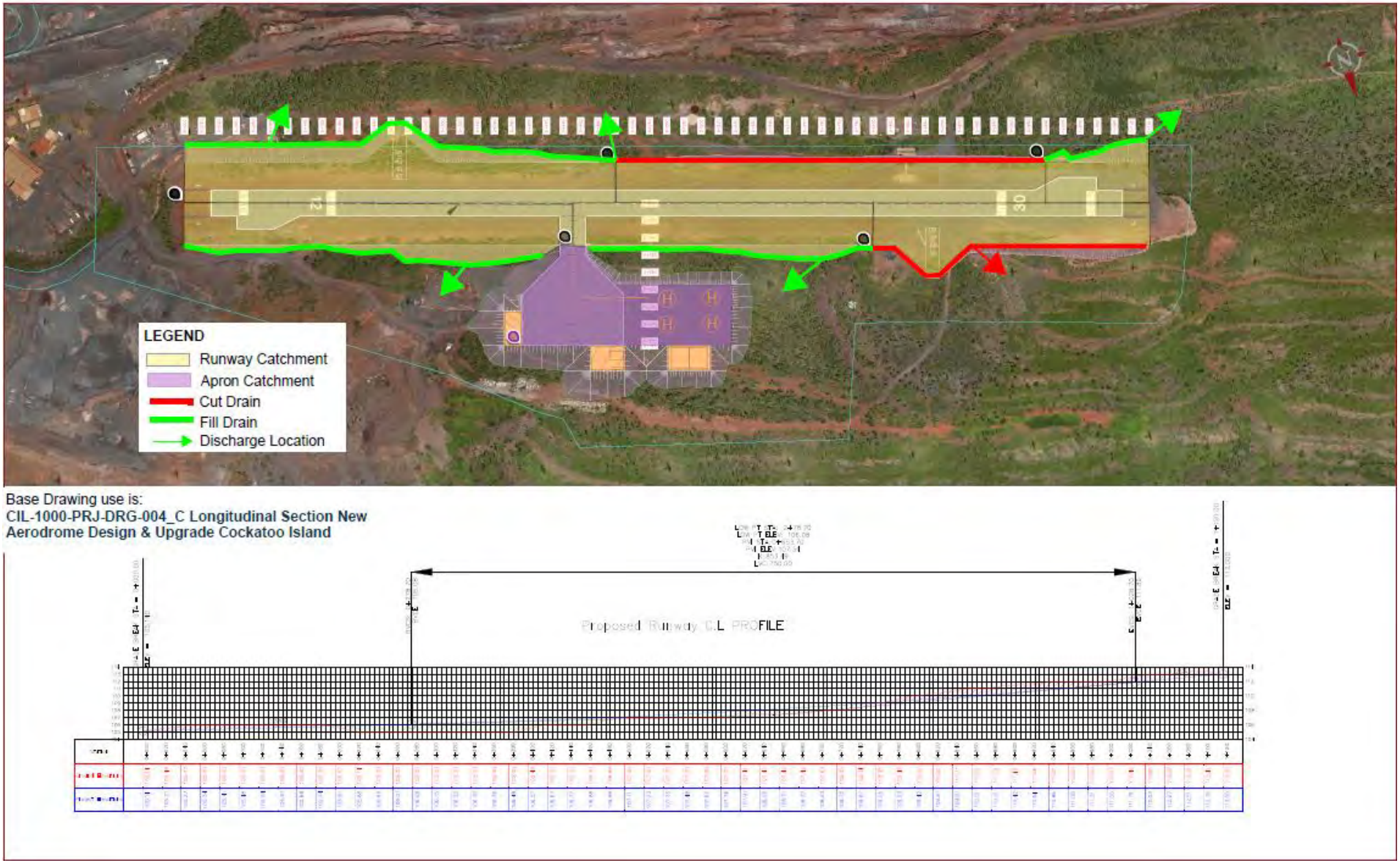

Figure 4.16 Aerodrome Concept Drainage Design

4.9.6 Mitigation

A Construction environmental management plan (CEMP) and operational environmental management plan (OEMP) have been prepared to manage and mitigate potential impact as a result of the construction and operation of the proposal (Appendix B). The Proponent has applied the mitigation hierarchy (avoid and minimise) to reduce the potential impacts to marine fauna during Proposal design. Potential impacts have been avoided or minimised through design of the DE and conceptual footprint, which along with specific mitigation measures are summarised in Table 4.39.

Table 4.39 Proposed mitigation measures for terrestrial environmental quality

Potential Impact	Proposed mitigation		
	Avoid	Minimise	Significant Residual Impact?
Contamination of soils from construction activities associated with storage of chemicals and potential spills.	– All chemicals are to be stored in accordance with relevant Australian standards, including: • AS1940: The Storage and Handling of Flammable and Combustible Liquids	– Spill kits are to be readily available at chemical storage locations and during maintenance, refuelling or transfer of chemicals. – All refuelling and servicing of plant, vehicles and equipment is to occur on a bunded area. – All on-site maintenance of plant, equipment and vehicles must be in designated, bunded areas.	No
Effective drainage design to prevent erosion of soils and mobilisation of potential contaminants throughout the Proposal area	– The Proposal has been redesigned to avoid and/or minimise interactions with, and disturbance to, watercourses, riparian vegetation and flood plains. – Proposed engineering controls and water management structures will be installed to ensure natural hydrological regimes are maintained.	– Water management structures will be designed to minimise the degradation of water quality by sedimentation, erosion or chemical pollutants.	No
Effective management of hydrocarbon handling and storage.	– All chemicals are to be stored in accordance with relevant Australian standards, including: • AS1940: The Storage and Handling of Flammable and Combustible Liquids	– Spill kits are to be readily available at chemical storage locations and during maintenance, refuelling or transfer of chemicals. – All refuelling and servicing of plant, vehicles and equipment is to occur on a bunded area. – All on-site maintenance of plant, equipment and vehicles must be in designated, bunded areas.	No

4.9.7 Predicted Outcomes

Given the proposed mitigation measures, no detrimental effects are anticipated to Terrestrial Environmental Quality as a result of the Proposal and the EPA's objectives for Terrestrial Environmental Quality can be met.

4.10 Key environmental factor – social surroundings

4.10.1 EPA objective

The WA EPA states that 'social surroundings is a part of the environment that may require consideration' where there is 'clear link between a proposal or scheme's impact on the physical or biological surroundings and the subsequent impact on a person's aesthetic, cultural, economic or social surroundings' (EPA, 2016d).

The WA EPA objective for social surroundings is 'to protect social surroundings from significant harm'.

4.10.2 Policy and guidance

- Statement of Environmental Principles, Factors and Objectives (EPA, 2020a);
- Environmental Factor Guideline – Social Surroundings (EPA, 2016d);
- Environmental Protection (Noise) Regulations 1997 (Noise Regulations);
- State Planning Policy 5.4 Road and Rail Noise;
- Aboriginal Heritage Act 1972 (AH Act); and
- *Aboriginal Cultural Heritage Act* (2021) (ACH Act).

4.10.3 Receiving environment

The receiving environment in relation to social surroundings is made of many elements including land tenure, historic and cultural features, tourism and recreational features, and amenity.

4.10.3.1 Native Title, Aboriginal Heritage and Culture

The Traditional Owners and determined native title holders for the area, the Dambimangari people represented by the Dambimangari Aboriginal Corporation (DAC) have provided their formal support for the Proposal which has been provided to the EPA. In addition, an Indigenous Land Use Agreement (ILUA) has been executed between Crestlink (formerly KTS), DAC and the Wanjina-Wunggur (Native Title) Aboriginal Corporation RNTBC (the prescribed body corporate for DAC) and formerly registered with the Native Title Tribunal. A summary of the ILUA and the consents provided for can be found at **https://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/ILUA%20Register/2024/WI2024.009/ILUARegisterExport.pdf**.

The ILUA includes business, employment, and training opportunities for the aboriginal groups relevant to the project area where Crestlink and the Traditional Owners have a well-established relationship having been engaging now for more than four years, in respect of the Proposal, including agreed management measures for the protection of cultural heritage and the environment.

The Proposal is located within the West Kimberley National Heritage Area. The Indigenous values of the West Kimberley National Heritage Place are not definitively mapped and indigenous people are the primary source of information on the value of their heritage. As detailed above, the Traditional Owners and determined native title holders for the area, have provided their support for the Proposal.

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System revealed that there are no Registered Sites nor any Other Heritage Places on Cockatoo Island. However, a Pre-ILUA Survey Heritage Impact Assessment (HIA) Notice was prepared by Crestlink in response to a request for more information from DAC's Board members to help inform the ILUA negotiations. As per the HIA notice the purpose of the Pre-ILUA survey was to provide:

a. a description of all locations lying within the ILUA Area which DAC agrees to have been "heavily disturbed" by activities or works carried out other than by Crestlink prior to the date of the Pre-ILUA survey,
b. a description of all other locations within the ILUA Area which were examined by the Survey Team as proposed (or possible) Crestlink Work Areas and have been:

i. Cleared, stating whether for all On-Ground Disturbance or only for those specified in the Pre-ILUA Survey Report;
ii. Cleared with Conditions; or
iii. Not Cleared; and

c. maps identifying:
i. the locations described for the purposes of sub-paragraph (a) above; and
ii. the locations described for the purposes of sub-paragraph (b) above as Cleared, Cleared with Conditions or Not Cleared.

The survey was successfully undertaken on the 15th and 16th June 2023. In response to the requirements of the survey as specified in the HIA notice the following results were reported:

– All of the cultural heritage sites known to Traditional Owners are located outside of the proposed ILUA area.
– The proposed ILUA area was therefore cleared for all ground disturbing activities with no conditions (refer Figure 4.17).
– A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Inquiry System revealed that there are no Registered Sites nor any Other Heritage Places on Cockatoo Island.

It is confirmed that there is no known Aboriginal heritage sites mapped within the Proposal Area and under the terms of the ILUA, Crestlink will continue to consult with DAC closely during the construction and operation of the project.

Figure 4.17 ***Map showing area within the orange polygon cleared by the survey team for all ground disturbing activities by KTS with no conditions (16/6/23).***

The Proposal is located within the West Kimberley National Heritage Place. The Indigenous values of the west Kimberley National Heritage Place are not definitively mapped. As detailed above, the Traditional Owners and determined native title holders for the area, have provided their support for the Proposal. Table 5.1 summarises the National Heritage Listing Criteria and National Heritage values relevant to West Kimberley and the area of Cockatoo Island (DotEE 2017a; DSEWPaC 2012; 2012a) and provides an assessment of potential impact to the values in relation to the Proposal.

The assessment concluded that the Proposal is unlikely to have a significant impact on the current condition of the National Heritage values of the West Kimberley National Heritage Place, due to:

– Previous disturbances to Cockatoo Island including vegetation clearing and construction of mining infrastructure (airstrip, processing plant, open pit mine, permanent sea wall and wharf with ship loading facilities) and the associated townsite
– Terrestrial works will be concentrated around previously cleared areas (e.g. the airstrip and mine). Clearing of up to 7.37 ha of native vegetation will be required
– The Proposal will disturb up to 5.75 ha of nearshore benthic marine habitat comprising 5.21 ha of bare rock, sand or pebbles and 0.54 ha of hard coral and algae
– The proposed new wharf is in close proximity to existing developed areas
– The Proposal will not cause further degradation, loss, modification or diminishment of the current aesthetic characteristics of Cockatoo Island and surrounds.

4.10.3.2 Historic Heritage

There are no known historic heritage places listed on either the State Heritage List, National Heritage lists, or local Municipal heritage lists associated with the Proposal.

4.10.3.3 Amenity

Th e Proposal Area is located in a remote area and is not close to any towns or population centres.

4.10.4 Potential impacts

Potential direct and indirect impacts to the Social Surrounds of the Proposal Area may result from the following project activities:

– Earthworks and materials haulage
– Movement of construction vehicles and machinery around the site.

Potential impacts to the social surrounds of the Proposal Area include:

– Physical damage to Aboriginal heritage sites (physical artefacts including artistic creations, built heritage such as buildings and monuments, and other physical or tangible products of human creativity);
– Impacts to anthropological values of heritage sites (Country – spiritual, physical, emotional values inherent to the identity of the Traditional Owners).
– Impacts to Myala and Lalang-gaddam A Class reserve marine parks
– Impacts to the West Kimberley national heritage area

Impacts to amenity during construction or operation of the Proposal are expected to be insignificant given the nearest residence is approximately 1 km from the Proposal Area. Dust generation will be managed to avoid impacting residents within the accommodation facilities.

4.10.5 Assessment of impacts

A joint heritage survey was completed in July 2023, with the Traditional Owners and Crestlink representatives. The survey team members were confident that their cultural sites of significance are located outside the proposed Indigenous Land Use Agreement (ILUA) and confident with their decision that the proposed ILUA area is cleared for all ground disturbing activities by Crestlink with no conditions.

The Indigenous values of the West Kimberley National Heritage Place are not definitively mapped, and indigenous people are the primary source of information on the value of their heritage. Consultation with the Traditional Owners and determined native title owners, has demonstrated support for the project. This support demonstrates that a best practice approach has been undertaken to determine the significance on any impacts on the Indigenous values of the west Kimberley National Heritage Place.

Subsequent to the evidence of support, an assessment of the impacts of the Proposal against the National Heritage Listing Criteria and National Heritage values relevant to West Kimberley and the area of Cockatoo Island

was undertaken. The assessment concluded that the Proposal is unlikely to have a significant impact on the current condition of the National Heritage values of the West Kimberley National Heritage Place, due to:

– Previous disturbances to Cockatoo Island including vegetation clearing and construction of mining infrastructure (airstrip, processing plant, open pit mine, permanent sea wall and wharf with ship loading facilities) and the associated townsite
– Terrestrial works will be concentrated around previously cleared areas (e.g. the airstrip and mine). Clearing of up to 7.37 ha of native vegetation will be required
– The Proposal will disturb up to 5.75 ha of nearshore benthic marine habitat comprising 5.21 ha of bare rock, sand or pebbles and 0.54 ha of hard coral and algae
– The proposed new wharf is in close proximity to existing developed areas
– The Proposal will not cause further degradation, loss, modification or diminishment of the current aesthetic characteristics of Cockatoo Island and surrounds.

Potential impacts to both Myala and Lalang-gaddam A Class reserve marine parks during vessel transit have been assessed with reference to the respective management plans (DBCA 2022a; DBCA 2022b). As outlined in these documents, vessel transit is a permitted use within all designated zones. The plans acknowledge additional controls including increase requirements for pilotage may be required however, it is expected that existing shipping channels will be maintained. As the project will use existing shipping channels, there is not expected to be any significant impacts to the Myala and Lalang-gaddam A Class reserve marine parks.

4.10.6 Mitigation

A Construction environmental management plan (CEMP) and operational environmental management plan (OEMP) have been prepared to manage and mitigate potential impact as a result of the construction on operation of the proposal (Appendix B). As detailed in these management plans, potential impacts will be reduced through the following measures:

– Detailed design and construction planning to avoid direct impacts to identified Aboriginal heritage sites of significance.
– Site induction and cultural awareness training will include recognition of aboriginal heritage sites, artifacts or possible remains and include individuals' responsibilities under the ACH Act and the Coroners Act.
– Conduct ongoing consultation with Traditional Owner representatives, in accordance with the ILUA.

Table 4.40 Proposed mitigation measures for social surroundings

Potential Impact	Proposed mitigation			
	Avoid	Minimise	Rehabilitate	Significant Residual Impact?
Disturbance of sites of cultural heritage significance	– The Proposal has been designed to avoid all sites of cultural heritage significance.	– Site induction and cultural awareness training will include recognition of aboriginal heritage sites, artifacts or possible remains and include individuals' responsibilities under the ACH Act and the Coroners Act. – Conduct ongoing consultation with Traditional Owner representatives, in accordance with the ILUA.	n/a	No.
Disturbance of places of cultural significance, plants and animals with cultural associations due to dust and noise.	– The proposed clearing has been designed to avoid significant habitats.	The Proponent will implement controls including: – Avoid any high dust emission works during high wind (e.g., vegetation clearing) and implement additional use of dust management measures (such as water carts and misting sprays) where these works are not avoidable. – Implement dust suppression measures including utilising water carts and misting sprays on unsealed roads and access tracks, cleared areas and at locations of high dust risk during construction. Measures will be implemented where dust is visible and based on predicted meteorological conditions. – Clearing activities will be limited to daylight hours to reduce impacts of noise, vibration and light on nocturnal foraging.	n/a	No
Impacts to the West Kimberley national heritage area	– The proposed clearing has been designed to avoid high quality vegetation and habitats.	– Site induction and cultural awareness training will include recognition of aboriginal heritage sites, artifacts or possible remains and include individuals' responsibilities under the ACH Act and the Coroners Act. – Conduct ongoing consultation with Traditional Owner representatives, in accordance with the ILUA.	n/a	No.

4.10.7 Predicted outcomes

Impacts to Aboriginal heritage will be avoided, however some impacts to Aboriginal heritage sites may be unavoidable. Consultation with Traditional Owners has been and will continue to be undertaken during the construction of the Proposal in order to understand the values present and to minimise impacts. Given the heritage survey did not identify any cultural sites within the Proposal area, no signification impacts to cultural heritage are anticipated.

Given the remote location of the Proposal Area, no significant impacts to amenity are anticipated.

4.11 Other factors – Greenhouse gas

Greenhouse gas emissions as part of this Proposal are expected to be produced during both construction and operations phase.

Construction Phase

Key activities associated with the construction phase of the Proposal that are anticipated to generate Scope 1 emissions include:

– Diesel consumption by mobile and stationary plant and equipment, including:
  - Major earth moving equipment (dozers, graders, excavators and trucks)
  - Minor ancillary equipment including cranes
  - Service vehicles and equipment including light vehicles, generators, service trucks and lighting towers
– Embodied carbon of materials
– No scope 2 emissions are expected to be produced during the construction phase of the Proposal.
– Scope 3 emissions associated with the Proposal include:
  - Embodied carbon of construction materials.

Operation Phase

– The key proposal activities that are anticipated to result in Scope 1 emissions are:
– Diesel consumption by mobile and stationary plant and equipment, including:
  - Minor ancillary equipment including cranes
  - Service vehicles and equipment including light vehicles, generators, service trucks

No scope 2 emissions are expected to be produced during the construction phase of the Proposal.

The key proposal activities that are anticipated to result in downstream Scope 3 emissions are:

– Fuel oil consumption by mobile equipment, including
  - Outbound marine transport.

The proposed emission source breakdowns are summarised in Table 4.41.

Table 4.41 Emissions breakdown from construction and operation phases of the proposal

Source	Scope 1 Emissions ($tCO2e^{-1}$)	Scope 2 Emissions ($tCO2e^{-1}$)	Scope 3 Emissions ($tCO2e^{-1}$)	Total Emissions Proportion
Construction (18 months)				
Transport	33	0	0	0.2%
Non-mobile (Cranes, generators)	1,374	0	0	7.3%
Vegetation Clearing	847	0	0	13.4%
Construction Materials	0	0	5,000	79.2%

Source	Scope 1 Emissions (tCO2e-1)	Scope 2 Emissions (tCO2e-1)	Scope 3 Emissions (tCO2e-1)	Total Emissions Proportion
Operations (annually)				
Mobile	11	0	0	0.1%
Stationary	477	0	0	4.5%
Downstream Transport	0	0	10,000	95.3%

Based on an expected 18-month duration of construction, the annual Scope 1 emissions are 2,254 tCO2e during construction and (including land clearing) and 488 tCO2e/annum during operations (based on 25 year life). This is below the 100,000 tCO2e/annum Scope 1 emissions threshold within the EPA Environmental Factor Guideline – Greenhouse Gas Emissions.

5. MNES

5.1 Controlled Action provisions

The proposal was referred to the Department of the Environment and Energy, now the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act on 17 July 2017 (EPBC 2017/7986).

On 18 August 2022, a delegate of the Commonwealth Minister for the Environment determined the referral was a controlled action and required assessment and approval under the EPBC Act. The controlling provisions for EPBC 2017/7986 are:

– National Heritage places (sections 15B & 15C)
– Listed threatened species and communities (sections 18 & 18A)
– Listed migratory species (sections 20 & 20A)
– Commonwealth marine area (sections 23 & 24A).

5.1.1 National Heritage Places

The Proposal area is located within the West Kimberley National Heritage Place which is listed under the EPBC Act. On 31 August 2011, the Minister for Environment included parts of the West Kimberley and its National Heritage values on the National Heritage List. Cockatoo Island is geographically located within the Buccaneer Archipelago which is part of the West Kimberley National Heritage Place. There are a number of national heritage values ascribed to the general area, which includes Cockatoo Island, and these are summarised in Table 5.1.

Table 5.1 Assessment of proposed Proposal against the National Heritage Criteria and Values relevant to Cockatoo Island

National Heritage Listing Criteria	West Kimberley National Heritage Place values	Potential Impact of the Proposal
Listing Criterion (a) – The place has outstanding heritage value because of the place's importance in the course, or pattern of Australia's natural or cultural history.	**Northern Kimberley coast and islands and the Kimberley Plateau, and the Devonian reefs of the west Kimberley** – plant, mammal, reptile, frog and invertebrate richness and endemism and as refugia protecting against human-induced environmental changes.	**No impact** The Proposal will require clearing of 7.37 ha of terrestrial native vegetation. Biological diversity within the Proposal area is less than that of the surrounding area with the vegetation of lower quality compared to similar vegetation within the local area, including the surrounding islands. The vegetation on surrounding islands and undisturbed areas of Cockatoo Island remains intact and has not been subject to historical disturbances that have occurred within the Proposal area. The Proposal area supports a number of native terrestrial fauna species, including two listed Threatened species (GHD 2017a). However, the habitat present within the Proposal is of lower quality compared to other areas of habitat within the local area including the surrounding islands. The quality of the fauna habitat proposed to be cleared is reduced given the existing disturbances it has been subject to since mining commenced on the island in 1951. Given Irvine Island is largely undeveloped, except for low-impact exploration activities in the 2010s, there is higher quality fauna habitat represented within the local area. The loss of this habitat is not expected to significantly reduce the area of habitat available for terrestrial fauna as refugia protecting against human-induced environmental changes. Biological surveys of the Proposal area have recorded a number of likely or potential Short Range Endemic invertebrate species, however due to recent fire the area of habitat for these species has been substantially, but temporarily, reduced (GHD 2017a). While the woodland habitat does represent habitat for potential SRE invertebrates, the habitat present in the DE does not represent areas of high quality refugia for these species. The loss of this habitat is not expected to significantly reduce the area of habitat available for SRE invertebrates as refugia protecting against human-induced environmental changes. The Proposal will disturb up to 6.18 ha of nearshore benthic marine habitat comprising 5.64 ha of bare rock, sand or pebbles and 0.54 ha of hard coral and algae. The location of the marine component of the proposal was selected as it is directly adjacent to existing marine development. Given a number of listed Threatened and Migratory marine species are likely to occur opportunistically within the Proposal area, the proposal area was located within an area where the quality of the benthic communities and habitats is low with more valuable habitat occurring in adjacent bays (GHD 2017a). Given this, the loss of this habitat is not expected to significantly reduce the area of benthic habitat available for marine fauna as refugia protecting against human-induced environmental changes.
	William Dampier landing place: Pender Bay, Karrakatta Bay, King Sound, the Buccaneer Archipelago and nearby coast – association with the life and work of William Dampier.	**No impact** Historical records do not indicate there is any association between the life and work of William Dampier and Cockatoo Island.
Listing Criterion (c) – The place has outstanding heritage	**West Kimberley coast from Cape Londonderry to the Lacepede Islands** –	**No impact**

value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.	potential to yield information on Indonesian Australian interaction.	A large proportion of the Proposal area has previously been disturbed through mining operations, and there is no potential to yield information on the Indonesian Australian interaction.
	The coastline from Cape Londonderry to Cape Leveque and the Devonian reef complex – potential to yield significant new archaeological information.	**No impact** The proposal area is located within the Dambimangari native title determination area. A pre-ILUA survey undertaken by Dambimangari Traditional Owners and representatives of the Crestlink did not identify Aboriginal cultural values within the proposed ILUA area (DAC 2023). It is noted that the proposed ILUA area aligns with the project's disturbance area. The Proposal will not compromise opportunities to study further archaeological information in the future outside of the DE.
	West Kimberley coast between Cape Londonderry and Cape Leveque – potential to yield information on the nature and effect of mega-tsunami.	**No impact** A large proportion of the Proposal area has been modified through historical mining operations. The Proposal will not compromise opportunities to study the nature and effect of mega-tsunami in the future.
Listing Criterion (d) – The place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural and cultural places; or (ii) a class of Australia's natural and cultural environments.	**The West Kimberley coast from Helpman Islands in King Sound to the western shore of Cambridge Gulf, including islands, peninsulas, inlets and inundated features, has outstanding heritage value to the nation under criterion (d)** for demonstrating the principal characteristics of a major coastal landform type, in an extensive region without significant modification by coastal infrastructure.	**No impact** Cockatoo Island has been mined since 1951 and the Proposal will not cause further significant degradation, loss, modification or diminishment of the existing coastal landform of the island. The decision to construct the marine components directly adjacent to the existing port means no significant alteration to the coastal landform will occur as this section of the Cockatoo Island coastline has already been modified as the embayment is not intact and no longer represents this landform type without significant modification by coastal infrastructure. The remaining coastline to the west remains intact with embayments un-modified. As discussed in Section 4.4.5, the 3D hydrodynamic modelling undertaken by GHD (2021) assessed the potential effect of the wharf proposal on coastal processes. This study showed that predicted changes to currents will be localised, of low magnitude, and restricted to the vicinity of the proposed wharf. Hence, interruption of longshore currents or existing coastal processes is not predicted. Further, material changes to the water current climate experienced by BCH are not predicted. The study also showed that bed shear stresses will be localised, of low magnitude, and restricted to the vicinity of the proposed wharf with no material change to areas of erosion and accretion. Further, material changes to the zones of accretion and erosion experienced by BCH are not predicted. The steep hard shoreline of southern Cockatoo Island and lack of substantive beaches also precludes any material effects even if there were material changes to nearshore currents and/or zones of accretion and erosion, which are not predicted. The wharf will not create tidally restricted bodies of water that are separated from Yampi Sound and consequently there will be no impact on coastal hydrodynamics as tidal current characteristics will not significantly change.
Listing Criterion (e) – The place has outstanding heritage value because of the place's importance in exhibiting	**The west Kimberley including: the coast from the Buccaneer Archipelago to King George River; Mitchell River National Park (NP); Windjana Gorge NP and Geikie**	**No impact**

particular aesthetic characteristics valued by a community or cultural group.	**Gorge NP; King George Falls and King George River; Geikie Gorge Conservation Park (CP) and King Leopold Ranges CP** – aesthetic characteristics valued by the Australian community.	Cockatoo Island has been mined since 1951 and the Proposal will not cause further significant degradation, loss, modification or diminishment of the current aesthetic characteristics of the Island and surrounds. The Proposal includes the upgrade of existing infrastructure on the island, predominantly around areas that have previously been developed and used for mining purposes. The proposed wharf development is immediately adjacent to the existing permanent seawall and wharf and will extend the existing developed area. The development is limited to an embayment that has already been significantly impacted by previous mining development. The nature of the embayment mean visual impacts are confined to these areas of existing development and undisturbed areas of coastline are not impacted. While some additional changes to the visual amenity will occur, these are limited to areas adjacent to the existing development, and do not substantially contribute to a loss of visual amenity in this area. The proposal has avoided any development within undeveloped areas of Cockatoo Island, thus preserving the visual amenity of the remaining coastline of the island.
Listing Criterion (f) – The place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.	**West Kimberley coast** – double log raft, a unique adaptation to the massive tidal variation – noted as an intangible value and has not been mapped.	**No impact** Cockatoo Island has been mined since 1951 and the extent of the environmental and heritage values across the island are largely known. There is limited potential to yield further information on the double log raft.
Listing criterion (i) - The place has outstanding heritage value to the nation because of the place's importance as part of Indigenous tradition.	The Wanjina-Wunggurr native title claim areas, where the painted images on rock and other features in the land, sea and sky, including natural rock formations and man-made stone arrangements, are manifestations of the Wanjina and the Wunggurr Snake, are of outstanding heritage value to the nation under criterion (i) because of their importance as part of Indigenous tradition	**No impact** The proposal area is located within the Dambimangari native title determination area. A pre-ILUA survey undertaken by Dambimangari Traditional Owners and representatives of the Crestlink in 2023 did not identify Aboriginal cultural values within the proposed ILUA area. It is noted that the proposed ILUA area aligns with the project's disturbance area.

5.2 Listed Threatened Species and Ecological Communities

The results of the terrestrial and marine field surveys (GHD 2014, GHD 2017, GHD 2025a, ecologia 2025) were combined with the results of the desktop assessment, including the EPBC PMST search (5 km search radius), to provide a likelihood of occurrence assessment for EPBC listed threatened species and ecological communities. A summary of this assessment is provided in Table 5.2.

Species considered unlikely to occur are not considered further in terms of potential impacts.

5.2.1 Listed Threatened Flora and Ecological Communities

No EPBC listed threatened flora species or ecological communities were identified as known or likely to occur within the Proposal area, or throughout Cockatoo Island (GHD 2014, GHD 2017a).

5.2.2 Listed Threatened Fauna

Two EPBC Act-listed terrestrial threatened fauna species were recorded in proximity to the Proposal area during biological surveys (GHD 2014; GHD 2017, ecologia 2025), including:

– Ghost Bat (*Macroderma gigas*) – Vulnerable. The Ghost Bat was recorded within the Proposal area during the 2025 field survey and there is suitable foraging habitat across the Island. There is also a potentially suitable roosting habitat (large sea cave) approximately 600 m north west of the Proposal area but its suitability has not been verified due to access restrictions
– Masked Owl (northern sub-species) (*Tyto novaehollandiae* subsp. *kimberli*) – Vulnerable. The northern sub-species of the Masked Owl was recorded 800m west of the Proposal area and there is suitable foraging habitat across the Island.

In addition, seven EPBC Act-listed threatened marine species were determined as likely / possible to occur within the Proposal area based on the presence of suitable habitat and nearby records (GHD 2025a), including:

– Northern Rver Shark (*Glyphis garricki)* – Endangered
– Largetooth Sawfish (*Pristis pristis*) - Vulnerable
– Green Sawfish (*Pristis zijsron*) – Vulnerable
– Green Turtle (*Chelonia mydas*) – Vulnerable
– Flatback Turtle (*Natator depressu*s) – Vulnerable
– Hawksbill Turtle (*Eretmochelys imbricata*) – Vulnerable
– Olive Ridley Turtle (*Lepidochelys olivacea*)

Each of these species is discussed further below.

Table 5.2 Threatened Species likelihood of occurrence assessment

Common name	Species names	EPBC Status	EPBC PMST Type of Presence	Likelihood within Proposal area	Justification
Birds					
Curlew Sandpiper	*Calidris ferruginea*	Critically Endangered	Species or species habitat may occur within area	Unlikely	Potential for this species to be an occasional vagrant visitor to Cockatoo Island utilising the beach and tidal zones, however no suitable habitat for the species is present within, or adjacent to, the Proposal area.
Eastern Curlew	*Numenius madagascariensis*	Critically Endangered	Species or species habitat may occur within area	Unlikely	Potential for this species to be an occasional vagrant visitor to Cockatoo Island utilising the beach and tidal zones, however no suitable habitat for the species is present within, or adjacent to, the Proposal area.
Red Goshawk	*Erythrotriorchis radiatus*	Vulnerable	Species or species habitat may occur within area	Unlikely	Potential for this species to be an occasional vagrant visitor to Cockatoo Island. Some suitable foraging habitat present for this species within the Proposal area, although this is not considered core habitat for the species. Red Goshawk habitat primarily consists of forest or dense woodland with a mosaic mix of vegetation associated with areas of billabong, river or swamp wetlands often with large bird (their prey) populations (Morcombe 2004).
Mammals					
Masked Owl (northern sub-species)	*Tyto novaehollandiae kimberli*	Vulnerable	Recorded during field surveys	Known	Recorded during field surveys (GHD 2014).
Ghost Bat	*Macroderma gigas*	Vulnerable	Recorded during field surveys	Known	Recorded during field surveys (GHD 2014).
Bare-rumped Sheath-tailed Bat	*Saccolaimus saccolaimus nudicluniatus*	Vulnerable	Species or species habitat may occur within area	Unlikely	Not recorded during field surveys and no core breeding or roosting habitat present for this species within the Proposal area. Species distribution likely to include the Kimberley, however not yet confirmed by genetic analysis (Threatened Species Scientific Committee (TTSC 2016)).
Marine Mammals					
Humpback Whale	*Megaptera novaeangliae*	Vulnerable	Breeding known to occur within area	Unlikely	Humpback Whales occur throughout Australian waters with their distribution influenced by their migratory pathways and aggregation areas for resting, breeding and calving. Humpbacks arrive in the coastal waters of the Kimberley after summer to breed and calve. These breeding activities are known to occur within waters surrounding the Proposal area, however after the winter

Common name	Species names	EPBC Status	EPBC PMST Type of Presence	Likelihood within Proposal area	Justification
					season has passed, Humpback Whales are likely be in deeper waters outside of the Proposal area as they return to the Antarctic. This species is not anticipated to occur within the Development Envelope given the inshore location.
Sharks					
Northern River Shark	*Glyphis garricki*	Endangered	Species or species habitat may occur within area	Possible	The DotE (2015) reports that the Northern River Shark utilise rivers, tidal sections of large tropical estuarine systems and macrotidal embayment's, as well as inshore and offshore marine habitats. Given this species known distribution, it is possible that they could occur in the Proposal area.
Whale Shark	*Rhincodon typus*	Vulnerable	Species or species habitat may occur within area	Unlikely	Whale Sharks have a broad distribution in tropical and warm temperate seas, and feed on phytoplankton, macroalgae, zooplankton, krill and small nektonic life, such as small squid or vertebrates. Whale Sharks undertake a well-known annual migration between March and June to aggregate in Ningaloo Marine Park and believed to be linked to localised seasonal peaks of coral spawning that occurs around March/April each year (Woodside 2011). Following this period, observers have recorded Whale Sharks migrating northwest to the Indian Ocean, or directly north to Sumatra and Java, or northeast passing within the region of Scott Reef and the Browse Basin and travelling along the 200 m contour (Woodside 2011). Due to the preference for deeper waters, the Whale Shark is unlikely to be found in the Proposal area.
Great White Shark	*Carcharodon carcharias*	Vulnerable	Species or species habitat may occur within area	Unlikely	Species currently known distribution is not near to the Proposal area (GHD 2025a).
Dwarf Sawfish	*Pristis clavata*	Vulnerable	Species or species habitat known within area	Unlikely	The distribution of Dwarf Sawfish is considered to be restricted to northern Australia, ranging from northern Queensland to the Pilbara coastline. Sawfish generally inhabit shallow coastal waters and estuaries, which are utilised as nurseries for juveniles. Surveys have found most captures of Dwarf Sawfish occur over soft sediment environments (DotE 2015). Given the known distribution of this species, it is unlikely that they would occur in the Proposal area.

Common name	Species names	EPBC Status	EPBC PMST Type of Presence		Likelihood within Proposal area	Justification
Largetooth Sawfish	*Pristis pristis*		Vulnerable	Species or species habitat known within area	Possible	This species has been recorded in riverine and marine environments across northern Australia and is known to have occurred within most of the subtropical areas between Cape Keraudren in Western Australia and Princess Charlotte Bay in Queensland. It is known to occur up to 100 km offshore. The generally accepted model of movement and migration of Largetooth Sawfish in Australian waters is that young are born at the mouths of rivers and in estuaries and then migrate upriver where they spend the first several years of life (Thorburn et al. 2004). As they reach maturity, they move out of the rivers and into the marine environment. Given this species known distribution, it is possible that they can occur in the Project area.
Green Sawfish	*Pristis zijsron*		Vulnerable	Species or species habitat known within area	Possible	The DotE (2015) reports that Green Sawfish are distributed from the Whitsundays to Shark Bay. Individuals have been recorded from inshore coastal environments and estuaries to offshore deep waters (Stevens et al. 2005). Given this species known distribution, it is possible that they could occur in the Proposal area.
Marine Reptiles						
Loggerhead Turtle	*Caretta caretta*		Endangered	Species or species habitat may occur within area	Unlikely	Loggerhead Turtles are globally distributed, occurring within coral, rocky reef, seagrass and muddy bay habitats throughout eastern, northern and western Australia (DotEE 2016a). Nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape (Ningaloo) in WA, although foraging areas are more widely distributed. There has also been one reported nesting at Ashmore Reef (Guinea 1995). Given the absence of important areas for feeding and nesting, it is unlikely that Loggerhead Turtles will be present in the Proposal area.
Leatherback Turtle	*Dermochelys coriacea*		Endangered	Species or species habitat may occur within area	Unlikely	Leatherback Turtles are pelagic feeders, found in tropical, subtropical and temperate waters throughout the world. This species regularly forages over Australian continental shelf waters and has been reported in south-western WA waters (Department of the Environment and Energy, 2016b). There are no major nesting areas recorded in Australia, although there are scattered records in the NT, Queensland and NSW (Department of the Environment and Energy, 2016b). Given the absence of important areas for feeding and nesting, it is highly unlikely that Leatherback Turtles occur in the Project area.

Common name	Species names	EPBC Status	EPBC PMST Type of Presence		Likelihood within Proposal area	Justification
Green Turtle	*Chelonia mydas*		Vulnerable	Congregation or aggregation known to occur within area	Likely	Green Turtles are the most widespread and abundant turtle species in Western Australia waters, nesting from the Ningaloo coast to the Kimberley Islands (Prince 1994). There are two known migration pathways for Green Turtles from Scott Reef and Browse Island to the Australian mainland coast – either travelling north-east to the Bonaparte Archipelago and then following the coast to the Northern Territory; or travelling south to Cape Leveque and along the coast to the Pilbara (Guinea 2010). Satellite tracking has shown that Green Turtles nesting on Browse Island and Sandy Island (Scott Reef) feed between 200 km and 1000 km from their nesting beaches (Pendoley 2005). In surveys by RPS (2010) from 2009-2010 in the Dampier Peninsula and Lacepede Islands, the majority of Green Turtles migrated north-east along the Kimberley coast in the post-nesting migration period (from approximately April). Given the known migration route and use of shallow benthic habitats for foraging, it is likely that Green Turtles could occur within and adjacent to the Proposal area.
Flatback Turtle	*Natator depressus*		Vulnerable	Congregation or aggregation known to occur within area	Likely	The Flatback Turtle is one of the two turtle species without a global distribution, found only in tropical waters of northern Australia, Papua New Guinea and Irian Jaya, with nesting confined to Australia (Limpus 2007). The Kimberley region is an important nesting area, with significant nesting occurring on the Lacepede Islands. Studies of Flatback Turtles during the 2009-2010 nesting season on the Lacepede Islands tracked several individuals via satellite tags during the inter-nesting and post-nesting periods (RPS 2010). Individuals were found to remain within 50 km of the Islands during the inter-nesting period. During post-nesting migration, turtles stayed in shallow depths, travelling from 17 km to up to 1,005 km, mainly staying within WA waters, such as Adele Island, Lacepede Island and the Maret Islands (north-east of Derby). Migration pathways of Flatback Turtles nesting in rookeries further south, such as Port Hedland, generally pass the Dampier Peninsula to probable foraging grounds in the Kimberley region (RPS 2010). Given the known migration route and use of shallow benthic habitats for foraging, it is likely that Flatback Turtles could occur within and adjacent to the Proposal area .
Hawksbill Turtle	*Eretmochelys imbricata*		Vulnerable	Species or species habitat	Likely	The species has a global distribution throughout tropical, sub-tropical and temperate waters, with nesting largely

Common name	Species names	EPBC Status	EPBC PMST Type of Presence		Likelihood within Proposal area	Justification
				may occur within area		concentrated on sub-tropical beaches (Marquex 1990). Adults tend to forage in tropical tidal and sub-tidal coral and rock reef habitats where they primarily feed on sponges and algae (DotEE 2017). Key nesting and inter-nesting areas include the Dampier Archipelago, Barrow Island, Lowendal and Thevenard Islands, with areas of Ashmore Reef, Cartier Island and Sandy Island. Given this turtle's regional presence and use of reefs for foraging, it is likely that the Hawksbill Turtle could occur in the Proposal area.
Olive Ridley Turtle, Pacific Ridley Turtle	*Lepidochelys olivacea*		Endangered	Species or species habitat may occur within area	Likely	The Olive Ridley Turtle nests throughout the globe in tropical waters withy migratory circuits through tropical and subtropical regions (Pritchard 1969). The Australian breeding population is recorded as the largest breeding population remaining in the south-east Asia-western Pacific region (Limpus 2008). Nesting has only been recorded in the NT and QLD throughout the Gulf of Carpentaria, however the turtle's migration path passes through waters nearby adjacent waters and therefore it is likely that the turtle could temporarily inhabit the Proposal area.

Ghost Bat

The present distribution of the Ghost Bat is widespread but intermittent throughout northern Australia, where it occupies a diverse range of habitats from the arid Pilbara to northern rainforests. During the day, Ghost Bats generally roost in large, often complex cave systems with several entrances, deep rock fissures, boulder piles, or mines. Individuals have been observed roosting in shallow rocky overhangs and sheds. The bats emerge from the roosts approximately one hour after sunset to forage (van Dyck et al. 2013). The Ghost Bat has a surface foraging strategy with two modes; it perches in vegetation to ambush passing prey (either on the ground or in the air), and it also gleans surfaces such as the ground while in flight. Its echolocation calls show wide variation (McKenzie and Bullen 2009).

Ghost Bats are known to occur on the nearby Koolan Island, and on other islands throughout the Buccaneer Archipelago. Echolocation calls of the Ghost Bat have been previously recorded from one location on Cockatoo Island, in the valley to the east of the accommodation village adjacent to the Proposal area (GHD 2014). This record indicates that there is likely to be a refuge for the species in close proximity to Cockatoo Island and this may be cave systems identified on Koolan Island. The woodland vegetation in the Proposal area, and on other areas of Cockatoo Island, provides foraging/hunting habitat for the Ghost Bat.

No Ghost Bat roosts or maternity caves were recorded within the Proposal area during the December 2016 field survey (GHD 2017a). However, one cave potentially suitable to support the species is present in the rocky coastal cliffs. This cave is approximately 600 m from the north-west boundary of the Proposal area. It is unknown if this cave is affected by tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species.

Masked Owl (northern sub-species)

The distribution of the northern sub-species of the Masked Owl is poorly known, however it is thought to occur in three subpopulations including the Kimberley, Northern Territory and Cape York. In the Kimberley region, the species occurs from Yampi Sound north-east to Cambridge Gulf, including Windjana Gorge and Augustus Island. The Masked Owl inhabits a variety of habitats from riparian forest, rainforest, open forest, Melaleuca swamps and the edges of mangroves, as well as along the margins of sugar cane fields (DotEE 2017b).

The Masked Owl has been previously recorded on the eastern side of the island in the woodland habitat, outside the Proposal area (GHD 2014). This record is considered to be at the western edge of its currently known range. This species is likely to utilise large eucalypt species with developed hollows for breeding and potentially forage over the entire island.

In its current form (i.e. recently burnt), the woodland habitat within the Proposal area may provide foraging habitat for the Masked Owl, however it provides limited value as breeding habitat (GHD 2017a). Nine trees with large hollows were recorded in the survey area during the December 2016 field survey, and these may be utilised by the species. However none of the hollows showed evidence of existing or historical use (i.e. owl pellets, scats or hollow scaring). Four of these trees occur within the Proposal area, all of which were burnt in a bushfire in May 2016, and their hollows may not now be suitable for the Masked Owl.

Northern River Shark

The Department of the Environment (2015a) reports that the northern river shark utilises rivers, tidal sections of large tropical estuarine systems and macrotidal embayments, as well as inshore and offshore marine habitats.

Given this species known distribution, it is possible that they could occur near the Proposal area. Strong currents in the local area would limit the Northern River Shark's presence in the bay proposed for the wharf (GHD 2017a).

Largetooth Sawfish

Records indicate that juvenile and sub-adult Largetooth Sawfish are largely found in the river systems of northern Australia. Adult species then travel into estuarine and marine environments. Pupping is known to occur around Broome and Derby and adults have been found to inhabit shallow sandy coastal waters (DotE 2015a).

There are no known records of the Largetooth Sawfish in the waters around Cockatoo Island, however given the Island's proximity to known pupping grounds, it is possible they could occur near the Proposal area. Strong currents in the local area would limit the Sawfish's presence in the bay proposed for the wharf (GHD 2025a).

Green Sawfish

The Department of the Environment (2015a) reports that Green Sawfish are distributed from the Whitsunday Islands to Shark Bay. Individuals have been recorded from inshore coastal environments and estuaries to offshore deep waters (Stevens et al. 2005).

Given this species known distribution and habitat preferences, it is possible that they could occur near the Proposal area. Strong currents in the local area would limit the Sawfish's presence in the bay proposed for the wharf (GHD 2025a).

Green Turtle

Green turtles are the most widespread and abundant turtle species in Western Australia waters, nesting from the Ningaloo coast to the Kimberley islands (Prince 1994). There are two known migration pathways for the Green Turtle from Scott Reef and Browse Island to the Australian mainland coast – either travelling north-east to the Bonaparte Archipelago and then following the coast to the Northern Territory; or travelling south to Cape Leveque and along the coast to the Pilbara (Guinea 2010). Satellite tracking has shown that Green Turtles nesting on Browse Island and Sandy Island (Scott Reef) feed between 200 km and 1000 km from their nesting beaches (Pendoley 2005). In surveys by RPS (2010) from 2009-2010 in the Dampier Peninsula and Lacepede Islands, the majority of Green Turtles migrated north-east along the Kimberley coast in the post-nesting migration period (from approximately April).

Given the known migration route and use of shallow benthic habitats for foraging, it is likely that Green Turtles could occur near the Proposal area (GHD 2025a). The species would likely use the locale of the proposed wharf development for opportunistic foraging while migrating through the area to other larger feeding grounds (e.g. seagrass beds). It is unlikely that the shallow benthic habitats within the area of the proposed wharf would provide principal foraging grounds for the species.

Flatback Turtle

The Flatback Turtle is one of the two turtle species without a global distribution, found only in tropical waters of northern Australia, Papua New Guinea and Irian Jaya, with nesting confined to Australia (Limpus 2007). The Kimberley region is an important nesting area, with significant nesting occurring on the Lacepede Islands. Studies of Flatback Turtles during the 2009-2010 nesting season on the Lacepede Islands tracked several individuals via satellite tags during the inter-nesting and post-nesting periods (RPS 2010). Individuals were found to remain within50 km of the islands during the inter-nesting period. During post-nesting migration, turtles stayed in shallow depths, travelling from 17 km to up to 1,005 km, mainly staying within WA waters, such as Adele Island, Lacepede Island and the Maret Islands (north-east of Derby). Migration pathways of flatback turtles nesting in rookeries further south, such as Port Hedland, generally pass the Dampier Peninsula to probable foraging grounds in the Kimberley region (RPS 2010).

Given the known migration route and use of shallow benthic habitats for foraging, it is likely that Flatback Turtles could occur near the Proposal area (GHD 2025a). The species would likely use the locale of the proposed wharf development for opportunistic foraging while migrating through the area to other larger feeding grounds (e.g. seagrass beds). It is unlikely that the shallow benthic habitats within the area of the proposed wharf would provide principal foraging grounds for the species.

Hawksbill Turtle

The species has a global distribution throughout tropical, sub-tropical and temperate waters, with nesting largely concentrated on sub-tropical beaches (Marquex 1990). Adults tend to forage in tropical tidal and sub-tidal coral and rock reef habitats where they primarily feed on sponges and algae (DotEE 2025a). Key nesting and inter-nesting areas include the Dampier Archipelago, Barrow Island, Lowendal and Thevenard Islands, with areas of Ashmore Reef, Cartier Island and Sandy Island.

Given this turtle's regional presence and use of reefs for foraging, it is likely that the Hawksbill Turtle could occur near the Proposal area (GHD 2025a). The species would likely use the locale of the proposed wharf development for opportunistic foraging while migrating through the area to other larger feeding grounds (e.g. coral and reef areas). It is unlikely that the shallow benthic habitats within the area of the proposed wharf would provide principal foraging grounds for the species.

Olive Ridley Turtle, Pacific Ridley Turtle

The Olive Ridley Turtle nests throughout the globe in tropical waters withy migratory circuits through tropical and subtropical regions (Pritchard 1969). The Australian breeding population is recorded as the largest breeding population remaining in the south-east Asia-western Pacific region (Limpus 2008). Nesting has only been recorded in the NT and QLD throughout the Gulf of Carpentaria, however the turtle's migration path passes through waters nearby adjacent waters and therefore it is likely that the turtle could temporarily inhabit the Proposal area.

5.3 Listed Migratory Species

The results of the terrestrial and marine field surveys (GHD 2014, GHD 2017, GHD 2017a) were combined with the results of the desktop assessment, including the EPBC PMST search, to provide a likelihood of occurrence assessment for EPBC listed Migratory species (Table 5.3).

Table 5.3 Migratory Species likelihood of occurrence assessment

Common name	Species names	Description and habitat	Likelihood
Marine Birds			
Common Noddy	*Anous stolidus*	During the breeding season, the Common Noddy usually occurs on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoals or cays of coral or sand. When not at the nest, individuals will remain close to the nest, foraging in the surrounding waters. Birds may nest in bushes, saltbush, or other low vegetation (DSEWPaC 2012b).	Unlikely – no suitable habitat within the Proposal area
Fork-tailed Swift	*Apus pacificus*	The Fork-tailed Swift is common in coastal and sub coastal areas between Carnarvon and Augusta including near and on offshore islands. There are scattered records along the south coast from Denmark east to Cocklebiddy on the Great Australian Bight, and sparsely scattered records inland. They are found across a range of habitats, from inland open plains to wooded areas. They are most often observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. They have been recorded well out to sea as well as from offshore islands especially when on passage from Indonesia. This species is almost exclusively aerial (DotE 2015).	Unlikely – species almost exclusively aerial and unlikely to rely on the habitat within Proposal area
Lesser Frigatebird	*Fregata ariel*	The Lesser Frigatebird is usually seen in tropical or warmer waters around the coast of north Western Australia, the Northern Territory, Queensland and northern New South Wales. It remains further out to sea during the day and in inshore waters during rough weather or in the late evening. Within the North-west Marine Region the lesser frigatebird is known to breed on Adele, Bedout and West Lacapede islands, Ashmore Reef and Cartier Island (DSEWPaC 2012b).	Known – recorded during field surveys flying in open water around the island. Species unlikely to rely on habitats in Proposal area
Great Frigatebird	*Fregata minor*	The Great Frigatebird is a widespread and breeds on numerous tropical islands (Nelson 2005). Within the North-west Marine Region it breeds in small numbers on Ashmore Reef. This species is pelagic although breeding birds probably forage within 100–200 km of the colony during the early stages of the breeding season (Nelson 2005). The diet consists mainly of flying fish with some cephalopods (Marchant and Higgins 1990).	Unlikely – No core habitat within the Proposal area
Red-footed Booby	*Sula sula*	Within the North-west Marine Region the Red-footed Booby breeds on Ashmore and Cartier islands. This species is pelagic and often encountered far from land (Nelson 2005). The red-footed booby is dependent for feeding on areas of high productivity that are often associated with underwater slopes adjacent to breeding islands (Marchant and Higgins 1990).	Unlikely – No core habitat within the Proposal area

Common name	Species names	Description and habitat	Likelihood
Terrestrial/Wetland Birds			
Red- rumped Swallow	*Cecropis daurica*	The Red-rumped Swallow is widespread across the Northern Hemisphere where it breeds. Records in Australia are of non-breeding migrants (December - February) and the species predominately forages over wetlands and open well-watered grasslands (DotE 2015).	Unlikely – no suitable habitat within the Proposal area
Oriental Cuckoo	*Cuculus optatus*	The Oriental Cuckoo is a regular migrant to Australia, where it spends the non-breeding season (Sept- May) in coastal regions across northern and eastern Australia as well as offshore islands. Non-breeding habitat includes monsoonal rainforest, vine thickets, wet sclerophyll forest or open *Casuarina*, *Acacia* or *Eucalyptus* woodlands. Frequently at edges or ecotones between habitat types. Riparian forest is favoured habitat in the Kimberley region (DotE 2015).	Unlikely – No core habitat within the Proposal area
Barn Swallow	*Hirundo rustica*	Barn Swallows are a cosmopolitan species, breeding throughout most of the northern hemisphere. Small numbers are regular non-breeding migrants to northern Australia, with vagrants further south. In tropical northern Australia, the Barn Swallows arrive Sept-October but the first southern records tend to be in November. Departure from the south is around March and in April from northern Australia. The species occurs in the air above open vegetated areas including native and agricultural grasslands as well as over open water areas (DotE 2015).	Unlikely – Species unlikely to rely on habitats in Proposal area
Grey Wagtail	*Motacilla cinerea*	The Grey Wagtail is a scarce but regular visitor to northern Australia, generally arriving during the last 10 days of October and departing around March. The species has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DotE 2015).	Unlikely – Species unlikely to rely on habitats in Proposal area
Yellow Wagtail	*Motacilla flava*	The Yellow Wagtail is a regular wet season visitor to northern Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water and the fringes of wetlands. Roosts in mangroves and other dense vegetation (DotE 2015).	Unlikely – Species unlikely to rely on habitats in Proposal area
Oriental Reed-Warbler	*Acrocephalus orientalis*	The Oriental Reed-warbler is a small insectivore, found in aquatic vegetation along waterways and waterbodies. The species is a wet-season (October – March) migrant to northern Australia, and whilst rare, it is probably a regular visitor. Non-breeding habitat includes emergent aquatic vegetation along waterways and water bodies (DotE 2015).	Unlikely – no suitable habitat within the Proposal area
Curlew Sandpiper	*Calidris ferruginea*	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Unlikely – no suitable foraging/roosting habitat within the Proposal area
Eastern Curlew	*Numenius madagascariensis*	The Eastern Curlew is a large non-breeding migratory shorebird, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. The species is found along the coastline from Barrow Island and Dampier Archipelago, through the Kimberley in WA to the NT. It is found in estuaries, bays, harbours, inlets and coastal lagoons, saltworks and sewerage farms, areas (e.g. intertidal mudflats or sandflats fringed by mangroves) often with beds of seagrass and occasionally on ocean beaches, coral reefs, rock platforms and rocky islets. The Eastern	Unlikely – no suitable foraging/roosting habitat within the Proposal area

Common name	Species names	Description and habitat	Likelihood
		Curlew forages on soft, sheltered, intertidal sand or mudflats, often near mangroves, on saltflats, saltmarshes, rockpools, coastal reefs and ocean beaches near the tideline. The species roosts in large flocks, separate from other waders on sandy spits and islets, dry beach sand near the high-water mark, among coastal vegetation (including low saltmarsh and mangroves) and occasionally on reef-flats, in the shallow water of lagoons, near-coastal wetlands, in trees and posts (Morcombe 2004).	
Osprey	*Pandion cristatus*	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant and Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays (DotE 2015).	Known – recorded during field surveys utilising coastal area of the island.
Mammals			
Bryde's Whale	*Balaenoptera edeni*	Byrde's Whales are the second smallest of the baleen whales. They inhabit tropical and warm temperate waters and generally travel alone or in pairs. This species appears to be limited to the 200 m depth contour, moving along the coast in response to the availability of suitable prey, while the offshore form is found in deeper waters (500 to 1,000 m) (Best 1977).	Unlikely
Dugong	*Dugong dugon*	North-western Australia is thought to have one of the largest populations of Dugongs in the world and are largely sighted feeding in wide and shallow seagrass beds but also in estuarine streams and streams (DSEWPaC 2012d). Regional sightings pooled from 1996 to 2008 show some sightings around Cockatoo and Irvine Island but notably less than that around the Dampier Peninsular, Derby and around the Walcott Inlet (Holley and Prince 2011).	Unlikely
Australian snubfin dolphin	*Orcaella heinsohni*	This dolphin is primarily found in nearshore habitats, but has been recorded up to 23 km offshore. Beagle Bay and Pender Bay are important areas for the Australian Snubfin Dolphin (DotEE 2016). The Australian Snubfin Dolphin is known to use the waters surrounding Cockatoo Island and the entire Buccaneer Archipelago for breeding. This species is not anticipated to occur within the Development envelope given the inshore location.	Unlikely
Indo-Pacific Humpback Dolphin	*Sousa chinensis*	The Indo-Pacific Humpback Dolphin is primarily found in nearshore habitats, such as those associated with the Buccaneer Archipelago (DotEE 2016). Indo- Pacific Humpback Dolphins typically occur in open waters around coasts and islands, generally in less than 20 m water depth (Parra *et al*. 2002).	Possible
Spotted Bottlenose Dolphin / Indian Ocean Bottlenose Dolphin	*Tursiops aduncus*	The Spotted Bottlenose Dolphin/Indian Ocean Bottlenose Dolphin is widely distributed in Indo-Pacific coastal waters, however there is limited information on the distribution and numbers of the Arafura/Timor sea population. The Spotted /Indian Ocean Bottlenose Dolphin has a discontinuous distribution in the warm temperate to tropical Indo-Pacific, from South Africa in the west, along the rim of the Indian Ocean (including the Red Sea, Persian Gulf and Indo- Malay	Likely

Common name	Species names	Description and habitat	Likelihood
		Archipelago as far east as the Solomon Islands and possibly New Caledonia) to the southern half of Japan and southeast Australia in the east (Wells and Scott 2002). These Dolphins generally occur in shallow coastal waters on the continental shelf or around oceanic islands.	
Reptiles			
Saltwater Crocodile	*Crocodylus porosus*	Saltwater Crocodiles are known to inhabit marine, coastal and riverine habitats from Port Hedland to Townsville (Department of Conservation and Land Management 2004). Anecdotal observations from Cockatoo Island confirm that Saltwater Crocodiles occur infrequently near the Proposal area and the species was recorded during the Aprasia Wildlife fauna survey of the island in 2009 (Aprasia Wildlife 2009).	Likely
Fish			
Reef Manta Ray	*Manta alfredi*	Reef Manta Rays commonly occur throughout the majority of Australian coastlines (DotE 2016b). Known on Australian waters from about Perth, Western Australia, around the tropical north to the Solitary Islands, New South Wales. Often seen inshore around coral and rocky reefs in tropical and subtropical waters. Manta Rays also occur around offshore reefs and seamounts. Individuals undertake seasonal migrations and aggregate at certain sites, presumably during times of high seasonal plankton productivity (Bray, 2017)	Possible
Giant Manta Ray	*Manta birostris*	Giant Manta Rays commonly occur throughout the majority of Australian coastlines (DotE 2016b). The Giant Manta Ray has a widespread distribution in tropical and temperate waters worldwide. In the Southern Hemisphere, it occurs as far south as Peru, Uruguay, South Africa, and New Zealand. It is an ocean-going species and spends most of its life far from land, travelling with the currents and migrating to areas where upwellings of nutrient-rich water increase the availability of zooplankton. The Giant Manta Ray is often in association with offshore oceanic islands (Marshall *et al*. 2011).	Possible
Killer Whale, Orca	*Orcinus orca*	Killer Whales are thought to be the most cosmopolitan of all cetaceans in Australasian waters and have been sighted along the Kimberley coast (Kimberley Society 2010). Although not common, the Killer Whale may occur in waters surrounding the Proposal area. This species is not anticipated to occur within the Development envelope given the inshore location.	Unlikely

Birds

Three species listed as Migratory under the EPBC Act were recorded during the December 2016 terrestrial field survey (GHD 2017). These were:

– Lesser Frigatebird (*Fregata ariel*)
– Osprey (Pandion cristatus)
– Common Sandpiper (*Tinga hypoleucos*).

These species were observed flying over the survey area, are considered highly mobile and would opportunistically utilise the Proposal area for foraging.

In addition, three species listed as Migratory under the EPBC Act were recorded during the 2013/2014 surveys of the entire Cockatoo Island (GHD 2014):

– Whimbrel (Numenius phaeopus)

– Common Greenshank (*Tinga nebularia*)
– Gull-billed Tern (Gelochelidon nigricans).

These three shorebird species were observed foraging along the tidal flats and nearby shoreline on the island, outside of the Proposal area. These species were not recorded in large numbers during the baseline surveys (GHD 2014), and it is likely that they opportunistically utilise the island for foraging and roosting. There is no suitable habitat for these three shorebird species within or immediately adjacent to the Proposal area.

The remaining 11 migratory bird species (including seabirds and shorebirds) identified in the PMST are considered unlikely to occur in the Proposal area on a regular basis and the habitats present within the Proposal area are well-represented elsewhere on Cockatoo Island as well as other islands in close proximity (e.g. Koolan and Irvine Islands). The woodland habitat and bay area within the Proposal area do not provide core habitat for any of these bird species and it is considered unlikely that these species would solely rely on the habitat available. In addition, with reference to DotE (2015), there is no important habitat for these bird species within the Proposal area.

Marine species

No marine species listed as Migratory under the EPBC Act were recorded during the marine flora and fauna survey in November 2016 (GHD 2025a). One species, the Saltwater Crocodile, has been noted in previous surveys as infrequently occurring near the Proposal area.

The potential for a number of marine migratory species to occur in proximity to the Proposal area was identified in the PMST search, and these species are discussed below.

Bryde's Whale

Byrde's Whales are the second smallest of the baleen whales. They inhabit tropical and warm temperate waters and generally travel alone or in pairs. This species appears to be limited to the 200 m depth contour, moving along the coast in response to the availability of suitable prey, while the offshore form is found in deeper waters (500 to 1,000 m) (Best 1977). Because of its small population, lack of sightings and preference for deeper water, it is unlikely to be encountered within the Proposal area.

Dolphins

Three species of dolphin were identified as potentially occurring near the Proposal area. Re-description and genetic research has shown the Irrawaddy Dolphin to be renamed the

Australian Snubfin Dolphin. This dolphin is primarily found in nearshore habitats, but has been recorded up to 23 km offshore. Beagle Bay and Pender Bay are important areas for the Australian Snubfin Dolphin (DotEE 2016).

The Indo-Pacific Humpback Dolphin is primarily found in nearshore habitats, such as those within the Buccaneer Archipelago (DotEE 2016). Indo-Pacific Humpback Dolphins typically occur in open waters around coasts and islands, generally in less than 20 m water depth (Parra *et al.* 2002).

Little is known about the distribution of the Spotted Bottlenose Dolphin in the Kimberley region, although they have been recorded at the shelf edge and shelf slope area of the Browse Basin in large, high energy, mixed schools in association with tuna, seabirds and other pelagic cetaceans. Small groups of these species have also been observed resting in nearshore areas of coast on the lee side of bays (DSEWPaC 2012c). In Australia, the Spotted/ Indian Ocean Bottlenose Dolphin is restricted to inshore areas such as bays and estuaries, nearshore waters, open coast environments, and shallow offshore waters including coastal areas around oceanic islands (DotEE 2017b).

Due to shallow water preferences, the Irrawaddy/Australian Snubfin, the Indo-Pacific Humpback and the Spotted / Indian Ocean Bottlenose Dolphins are likely to be present all year round near the Proposal area.

Saltwater Crocodile

Saltwater Crocodiles are known to inhabit marine, coastal and riverine habitats from Port Hedland to Townsville (Department of Conservation and Land Management 2004). Anecdotal observations from Cockatoo Island confirm that Saltwater Crocodiles occur infrequently near the Proposal area and the species was recorded during the Aprasia Wildlife fauna survey of the island in 2009 (Aprasia Wildlife 2009). Saltwater Crocodiles would be an infrequent visitor to the Proposal area.

Reef Manta Ray and Giant Manta Ray

Manta Rays commonly occur along the majority of Australian coastlines. The Reef and Giant Manta Rays may potentially visit the Proposal area for foraging.

5.4 Commonwealth Marine Area

The Proposal is located approximately 27km south east of a Commonwealth Marine Area. Given the distance from the proposed activities, both construction and operations, there will not be impacts to a Commonwealth Marine Area.

5.5 Potential impact and assessment

5.5.1 National Heritage Places

Table 5.1 summarises the National Heritage Listing Criteria and National Heritage values relevant to West Kimberley and the area of Cockatoo Island (DotEE 2017a; DSEWPaC 2012; 2012a), and provides an assessment of potential impact to the values in relation to the Proposal.

The following avoidance and mitigation measures are proposed:

– Detailed design and construction planning to avoid direct impacts to identified Aboriginal heritage sites of significance.
– Site induction and cultural awareness training will include recognition of aboriginal heritage sites, artifacts or possible remains and include individuals' responsibilities under the ACH Act and the Coroners Act.
– Conduct ongoing consultation with Traditional Owner representatives, in accordance with the ILUA.

The assessment concluded that the Proposal is unlikely to have a significant impact on the current condition of the National Heritage values of the West Kimberley National Heritage Place, due to:

– Previous disturbances to Cockatoo Island including vegetation clearing and construction of mining infrastructure (airstrip, processing plant, open pit mine, permanent sea wall and wharf with ship loading facilities) and the associated townsite
– Terrestrial works will be concentrated around previously cleared areas (e.g. the airstrip and mine). Clearing of up to 7.37 ha of native vegetation will be required
– The Proposal will disturb up to 5.75 ha of nearshore benthic marine habitat comprising 5.21 ha of bare rock, sand or pebbles and 0.54 ha of hard coral and algae
– The proposed new wharf is in close proximity to existing developed areas
– The Proposal will not cause further degradation, loss, modification or diminishment of the current aesthetic characteristics of Cockatoo Island and surrounds.

5.5.2 Listed Threatened Species and Ecological Communities

Clearing and loss of terrestrial habitat

Vegetation clearing for the Proposal will result in the permanent loss of habitat for the Ghost Bat and northern sub-species of the Masked Owl, including:

– Up to 7.37 ha of potential foraging/hunting woodland habitat for the Ghost Bat
– Up to 7.37 ha of potential foraging and low value breeding habitat for the Masked Owl (northern).

Ghost Bat

A review of the Significant Impact Guidelines 1.1 was undertaken to consider the significance of potential impacts to the Ghost Bat from the Proposal (Table 5.4). For the purpose of this assessment an important population of the Ghost Bat is the population restricted to the Kimberley region including all known records and locations documented.

The following avoidance and mitigation measures are proposed:

– Clearing shall be kept to the minimum amount required.
– Survey and clearly demarcate clearing areas prior to clearing commencing, including flagging and signage.
– Observers and spotters will be used when working near sensitive sites, e.g., when clearing boundaries may not be readily visible (for example due to dense vegetation). I
– Induct relevant personnel and contractors on land disturbance and vegetation clearing management including:
    - Key protection measures being implemented;
    - “no-go” areas;
    - Clearing boundaries.
– Construction vehicle movements, including clearing activities, will occur during daylight, which will minimise interactions with nocturnal species
– Clearing will be undertaken progressively in one direction to allow fauna to disperse to other habitats.
– Clearing will commence, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally).
– Vehicles, plant, and machinery not required for clearing activities will be restricted to designated roads/access tracks and cleared areas.

The assessment concluded that the Proposal is unlikely to have a significant impact to an important population of the Ghost Bat because:

– No known core habitat (e.g. caves for breeding or roosting) for the Ghost Bat was recorded during the field surveys; foraging/hunting habitat is present only
– There is a low risk of impact to one cave, approximately 600 m from the Proposal area, which is unlikely to provide suitable roosting habitat for the species. It is unknown if this cave is affected by the tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species.

Table 5.4 Significant Impact Criteria for Ghost Bat

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population	**Unlikely** There are approximately 44 records of the Ghost Bat held in the NatureMap database within the Mitchell IBRA subregion (DPaW 2007). These records indicate that the species is sparsely distributed throughout the subregion. The species current range is discontinuous, with geographically disjunct colonies in the Pilbara, Northern Territory, Gulf of Carpentaria, Cape York to Rockhampton and Western

Significant Impact Criteria	Impact Outcome
	Queensland (TTSC 2016a). The Kimberley population is genetically distinct from all other populations (McKenzie and Bullen 2012; Worthington Wilmer 1996), with recent studies indicating the distinctness of the Pilbara and Kimberley subpopulations. The Kimberley colonies contain approximately two-thirds of Western Australia's Ghost Bat population, and are likely to be relatively stable as little mining or habitat destruction occurs in the region (TTSC 2016a). The estimated current population size of the species in the Kimberley is 3,000-4,000 individuals (McKenzie and Hall, 2008). During McKenzie and Bullen's (2012) survey of the Kimberley islands from King Sound in the south-west to Cambridge Gulf on its eastern edge, they noted the Ghost Bat appeared to be widespread and common. The species was observed on five islands and detected via calls on six others; including Angustus, Sir Graham Moore, Storr, Boongaree, Coronation, Koolan, Kingfisher, St Andrew and NW Molema islands. The Proposal is associated with the loss of 7.37 ha of potential foraging/hunting habitat for the Ghost Bat, and it is likely the species would utilise this habitat opportunistically. There are no known roosts or maternity caves on Cockatoo Island; and the one known cave at the western end of the island is unlikely to provide suitable roosting habitat for the species. It is unknown if this cave is affected by the tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species (GHD 2017a). The cave occurs outside the area proposed for development and potential impacts to the cave will be limited to blasting activities during construction. Management measures will be in place during high impact activities, to minimise noise and vibration impacts (i.e. limiting blasting in close proximity to the cave). It is unlikely that the loss of potential foraging/hunting habitat or potential impacts to the cave would be considered substantial to the Kimberley population of the Ghost Bat. It is unlikely that the Proposal will lead to the long-term decrease in the size of the Kimberley population of the Ghost Bat.
Reduce the area of occupancy of an important population	**Unlikely** The Proposal is unlikely to substantially reduce the area of occupancy of a population of Ghost Bats within the local area or region. The Proposal may reduce the overall area of suitable foraging/hunting woodland habitat for the species (7.37 ha), as a result of direct loss of habitat from clearing. There is also a low risk of minor impacts to a small area of potential roosting habitat (although the validity of this habitat is yet to be confirmed). It is unknown whether this cave is utilised by or provides suitable habitat for any bat species, and the Proposal is unlikely to result in direct impacts on the cave. McKenzie and Bullen's (2012) note that "*loss of complexity in riparian vegetation, reduced permanence of pools, loss of mangrove stands and loss of suitable cave roosts, are all likely to reduce occupancy"* of bat species in islands in the Kimberley. The Proposal will not result in a loss of any such vegetation on Cockatoo Island. The removal of this foraging/hunting habitat is not considered to be significant the Ghost Bat, due to the availability of potential habitat in proximity to the Proposal and the wider Kimberley region and small extent of removal compared to the extent of available habitat throughout the species range.
Fragment an existing important population into two or more populations	**Unlikely** The Proposal is unlikely to fragment the population into two or more populations. The Ghost Bat is a highly mobile species and able to traverse the small distances between the islands in the Buccaneer Archipelago for foraging. Foraging bats search for prey from vantage points in trees before making short flights to capture prey; and foraging areas have been found to be centred, on average, 1.9 km from the daytime roost (Tidemann *et al.* 1985). The conservation advice for the species states: "*to persist in an area, small colonies require a group of caves/shelters that provide alternative day and night roost sites, and a gully or gorge system that opens onto a plain or riparian line that provides good foraging opportunities, typically less than 5 km from the diurnal roost site*" (pg. 5, TTSC 2016a). Cockatoo Island is located in close proximity from both Koolan and Irvine Islands (approximately 5 km) and the mainland (approximately 6 km), and is therefore in proximity to other areas which may provide roosting habitat. The species has previously been recorded on Koolan Island (McKenzie and Bullen 2012), however no roosting or maternity caves are known to occur (Mount Gibson Iron 2012). Clearing of 7.37 ha of suitable habitat for the species is therefore unlikely to create a substantial gap in the connectivity of habitat in the local area, and it is unlikely that the

Significant Impact Criteria	Impact Outcome
	removal of vegetation within the development footprint will fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely** The Project activities are associated with the loss of 7.37 ha of potential foraging/hunting woodland habitat. No known core habitat (e.g. caves for breeding or roosting) for the Ghost Bat was recorded in the survey area. This habitat is not listed on the Register of Critical Habitat maintained by the minister under the EPBC Act (DotE 2013, pp10). The Proposal is unlikely to affect habitat critical to the survival of the Ghost Bat.
Disrupt the breeding cycle of an important population	**Unlikely** Ghost Bats mate during July and August. Gestation takes three months with a single young being born between September and November each year. Females form maternity colonies separate from males while the young are being weaned, and maternity colonies may contain numerous individuals. Ghost bats move between a number of caves seasonally or as dictated by weather conditions, and require a range of cave sites (Hutson *et al*. 2001). Most breeding sites appear to require multiple entranced caves (McKenzie and Hall 2008). There are no known roosts or maternity caves on Cockatoo Island; and the one known cave at the western end of the island is unlikely to provide suitable roosting habitat for the species. It is unknown if this cave is affected by the tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species (GHD 2017a). As such, it is unlikely that the breeding cycle will be disrupted for any individual of the local population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely** The works associated with the Proposal may modify and destroy a proportion of foraging/hunting woodland habitat for the Ghost Bat, but not to the point that the species would decline.
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat	**Unlikely** The Proposal is unlikely to result in the establishment of an invasive species, however the Proposal may potentially exacerbate existing invasive species (e.g. weeds) that already occur on Cockatoo Island during the construction phase, when waste and human activity will be more intensive.
Introduce disease that may cause the species to decline	**Unlikely** The Proposal is unlikely to introduce a disease that may cause this species to decline. There are no known diseases that may be introduced to the area that may cause the Ghost Bat Kimberley population to decline.
Interfere with the recovery of the species.	**Unlikely** The Project is unlikely to interfere substantially with the recovery of the Ghost Bat. It is unlikely to substantially interfere with the regional and local priority actions listed in the Conservation Advice Statement for the species (TSSC 2016a).

Masked Owl (northern sub-species)

A review of the Significant Impact Guidelines 1.1 was undertaken (Table 5.5) to consider the significance of potential impacts to the Masked Owl (northern) from the Proposal. For the purpose of this assessment an important population of the Masked Owl (northern) is the population restricted to the Kimberley region including all known records and locations documented.

The following avoidance and mitigation measures are proposed:

– Clearing shall be kept to the minimum amount required.
– Survey and clearly demarcate clearing areas prior to clearing commencing, including flagging and signage as required.
– Observers and spotters will be used when working near sensitive sites, e.g., when clearing boundaries may not be readily visible (for example due to dense vegetation). I

– Induct relevant personnel and contractors on land disturbance and vegetation clearing management including:
  - Key protection measures being implemented;
  - “no-go” areas;
  - Clearing boundaries.
– Construction vehicle movements, including clearing activities, will occur during daylight, which will minimise interactions with nocturnal species
– Clearing will be undertaken progressively in one direction, to allow fauna to disperse to other habitats.
– Clearing will commence, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally).
– Vehicles, plant, and machinery not required for clearing activities will be restricted to designated roads/access tracks and cleared areas.

The assessment concluded that the Proposal is unlikely to have a significant impact to an important population of the northern sub-species of the Masked Owl because:

– Due to recent fires on the island, there is limited core habitat (e.g. trees with hollows for breeding) present within the Proposal area. Nine trees with hollows suitable for breeding were recorded during the recent field survey either within or in close proximity to the Proposal area. Four of these trees occur within the Proposal area and their hollows may not now be suitable for the Masked Owl
– Suitable habitat is available elsewhere on the Island, and on Koolan and Irvine Islands, and the species has previously been recorded on Koolan Island. Both Koolan and Irvine Islands are located within flying distance for the Masked Owl, and it is unlikely that the loss 7.37 ha of potential habitat would substantially reduce the area of habitat available to the species or result in a long-term decrease in the size of the Kimberley population of the species. The species is likely to utilise the Proposal area opportunistically for foraging.
– In its current form (i.e. recently burnt), the woodland habitat within the Proposal area provides limited potential breeding habitat for the Masked Owl (northern sub-species).

Table 5.5 Significant Impact Criteria for Masked Owl

Significant Impact Criteria	Impact Outcome
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population	**Unlikely** The northern sub-species of the Masked Owl has previously been recorded adjacent to the Proposal area on Cockatoo Island and there is suitable foraging habitat and limited potential breeding habitat present. The distribution of the Masked Owl (northern) is very poorly known, and three sub-populations have been suggested, the Kimberley, Northern Territory and Cape York (Garnett *et al*. 2011). There are very few (approximately five) records of the northern sub-species of the Masked Owl in the Kimberley region, between Yampi Sound in the north-east to Cambridge Gulf, including Windjana Gorge and Augustus Island (DPaW 2007). There are also historical records form near Broom (Crossman 1910). <u>Foraging habitat</u> The Proposal activities are likely to result in the removal of 34.23 ha of suitable foraging habitat for the species, of which 18.43 ha is in degraded to degraded/ completely degraded condition. The remainder of the island contains suitable foraging habitat for the species. <u>Breeding habitat</u> The Proposal activities are likely to result in the loss of 7.37 ha of potential breeding habitat from Cockatoo Island. During the most recent field survey in December 2016 the woodland vegetation throughout the Proposal area had recently been burnt, reducing its current value in providing breeding resources for the Masked Owl. During the field survey a total of nine trees were recorded with hollows large enough to potentially be utilised by the species for breeding. Four of these trees occur within the Proposal area.

Significant Impact Criteria	Impact Outcome
	A review of aerial photography of Cockatoo Island and other surrounding islands (e.g. Koolan, Bathurst and Irvine Islands) suggests that the extent of potential habitat for the species is likely to be well-represented in the local area. In addition, one Beard (1977) vegetation association (association 8001) mapped within the Proposal area partially aligns with the Masked Owl habitat (woodland) recorded during the survey. The extents of the vegetation associations have been determined by the State-wide vegetation remaining extent calculations maintained by the DPaW (Current as of June 2015 (latest update May 2016) – GoWA 2015). The current extents of vegetation associations remaining are greater than 85 % of the pre-European extent at all scales (e.g. State, IBRA Bioregion, IBRA Sub-region and LGA) (GHD 2017a). It is difficult to estimate the extent the types of suitable habitat within the vegetation associations (e.g. the extent breeding habitat) however it is reasonable to assume that the extent of similar potentially suitable habitats within the locality is probably well represented. It is unlikely that the loss of habitat from the Proposal area is substantial to the Masked Owl. It is unlikely that the Proposal will lead to the long-term decrease in the size of an important population of the northern sub-species of the Masked Owl.
Reduce the area of occupancy of an important population	**Unlikely** The Proposal is unlikely to substantially reduce the area of occupancy of a population of Masked Owls within the local area or region. The Proposal may reduce the overall area of potentially suitable habitat for Masked Owl (7.37 ha) as a result of direct loss of habitat from clearing. The removal of this habitat (including foraging and low value potential breeding habitat) is not considered to be significant the Masked Owl, due to the availability of potential habitat in proximity to the Proposal and the wider Kimberley region and small extent of removal compared to the extent of available habitat throughout the species range.
Fragment an existing important population into two or more populations	**Unlikely** The Proposal is unlikely to fragment the population into two or more populations. The Masked Owl (northern) is sedentary, territorial and usually seen singly but occasionally in pairs or family groups (TTSC 2015). The Masked Owl is a mobile species and likely to traverse small distances between the islands in the Buccaneer Archipelago. Clearing of the 7.37 ha of suitable habitat for the species is therefore unlikely to create a substantial gap in the connectivity of habitat in the local area, and it is unlikely that the removal of vegetation within the development footprint will fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species	**Unlikely** The habitat located within the Proposal area is likely to support foraging and currently provides low value potential breeding habitat for the species. The Proposal activities are likely to result in the removal of 7.37 ha of suitable foraging and low value breeding habitat for the species, of which 0.97 ha is in poor condition. This habitat is not listed on the Register of Critical Habitat maintained by the minister under the EPBC Act (DotE 2013, pp10). The Proposal is unlikely to affect habitat critical to the survival of the Masked Owl (northern).
Disrupt the breeding cycle of an important population	**Unlikely** The works associated with the Proposal are unlikely to disrupt the breeding cycle of the population of Masked Owls (northern sub-species) in the Kimberley region given that there was no current or historical evidence of breeding recorded during previous field surveys. In addition, the vegetation within the Proposal area currently provides low value habitat for breeding resources with the recent fire resulting in reduced availability of hollows. As such, it is unlikely that the breeding cycle will be disrupted for any individual of the local population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely** The works associated with the Proposal may modify and destroy a proportion of foraging habitat and low value breeding habitat for the Masked Owl (northern), but not to the point that the species would decline.
Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat	**Unlikely** The Proposal may potentially exacerbate existing invasive species (such as weeds) that already occur within the Proposal area, and may also result in the establishment of an

Significant Impact Criteria	Impact Outcome
	invasive weed species. However, these weed species are unlikely to be harmful to Masked Owl (northern) individuals. The Proposal is unlikely to result in an invasive species becoming established in the development footprint to the extent that Masked Owls (northern) are substantially impacted.
Introduce disease that may cause the species to decline	**Unlikely** The Proposal is unlikely to introduce a disease that may cause this species to decline. There are no known diseases that may be introduced to the area that may cause the Masked Owl (northern) population to decline.
Interfere with the recovery of the species.	The Proposal is unlikely to interfere substantially with the recovery of Masked Owl (northern) as it is unlikely to interfere with the recovery actions outlined on the species profile in the DotEE (2017b), including: – Establish and operate a recovery team or regular forum or alliance to assist in the coordination of management actions – Examine the impacts of land clearing, particularly in the Darwin-Daly River region, and the response to historic clearing in north-eastern Queensland, and use the resulting knowledge to generate guidelines to protect habitat in landscapes subject to increasingly intensive development – Develop a monitoring program to provide effective and accurate measures of trends in status – Assess the population size, distribution and habitat requirements – Assess trends in response to management interventions – Assess causes for decline, i.e. small mammal decline – Maintain and enhance the suitability of habitat through fire management – Minimise the impacts of current and proposed land clearing activities – Minimise the impacts caused by the spread of exotic pasture plants

Direct loss of benthic communities, habitat and waters

Construction of the wharf will result in the direct loss of approximately 5.75 ha of benthic habitat comprising:

– 5.21 ha of bare rock, sand or pebbles
– 0.54 ha of area with hard coral and algae.

This area also includes the sub-tidal and intertidal waters above the benthic communities.

These habitats may support marine fauna that use the habitats as food sources, refugia, spawning and nursery grounds.

The results of the marine habitat survey indicated that habitat quality and benthic community coverage of the bay is substantially lower than that of the two bays to the east of the Proposal area (GHD 2025a). Previous marine benthic surveys have also demonstrated that the quality of habitat and occurrence of benthic communities and habitats has been previously compromised to the northwest of the proposed wharf development, because of mining-related operations.

Post-construction, the benthic communities and habitats will be altered locally.

The floating wharf and moored vessels at the wharf will reduce light reaching the seabed beneath. Any photosynthetic benthic communities such as hard coral or algae may be effected by the reduced light climate, which may affect marine fauna that previously utilised this area. Conversely, shaded structures also attract some marine fauna species as an area of refuge.

From observations of flora and fauna living on or around the existing ship loader piles, it is anticipated that a similar community assemblage will colonise proposed wharf infrastructure. This will provide alternative food sources, habitat and refugia for some marine fauna species.

The following avoidance and mitigation measures are proposed:

– Operational vessels will not typically anchor
– The floating wharf structures are located in deep waters and will not shade areas with benthic primary producers such as hard coral or algae

– The zones of predicted BCH (i.e. hard corals and macroalgae) impact/effect are defined following EPA (2021) as follows:
    - The Zone of High Impact (ZoHI) comprises permanent irreversible direct losses under the reclamation footprint
    - There is no predicted Zone of Moderate Impact (ZoMI) for indirect reversible BCH losses as GHD (2021) simulated sedimentation rates are lower than the minimum published values of >100 g/m2/d (Lock et al 2024) for mortality of hard corals
    - The boundary of the Zone of Influence (ZoI) is defined on the basis of GHD (2021) sedimentation rates of >1 g/m2/d where potential adverse BCH effects may potentially occur as low as 10 g/m2/d (Tuttle & Donahue 2022). This zone is illustrated in in Figure 4.6
    - Beyond the ZoI no effects from construction activities on turbidity and sedimentation are predicted.
– Carry out pre-construction, post-construction and operational phase (once every 2 years) surveys of BCH in the two adjacent bays. If a decrease in hard coral cover or macroalgae is identified, then notify the EPA to implement appropriate management measures
– Undertake continuous water temperature measurements to demine if potential coral bleaching event may occur. Should elevated temperature be recorded, undertake a risk assessment to determine if potential sedimentation may impact heat stressed corals, using the results of the below sediment plume observations.
– During construction sub-daily photographs from a fixed elevated site will be used to document the intensity and spatial extent of the turbidity plume. If the plume extends for persistent periods into high value BCH regions (e.g. Bay 2) then management measures will be triggered to reduce the extent of the plume. Management measures to reduce/eliminate unacceptable turbid plume impacts include:
    - Additional layers of geotextile fabric within the reclamation area
    - Installation of silt curtains
    - Reduction in the rate of construction
    - Temporarily cease construction.

The planned activities are unlikely to significant impact conservation significant marine fauna as there is no known critical habitat for any species within the bay.

Reduction in marine environmental quality

A temporary reduction in water quality during construction may occur during drilling of the piles, inserting and anchoring of the sheet piles and placement of fill material. A reduction in water quality may occur through re-suspension of fine material that could smother benthic habitats, reducing the light climate reaching photosynthetic organisms.

During construction and operation, a number of solid and liquid wastes will be generated on both land and any vessels, including sewage, bilge waters, cooling waters, deck drainage, food wastes, lubricating oils and hydraulic oils. If released into the marine environment, hazardous and non-hazardous wastes and discharges could affect marine fauna through direct toxicity, ingestion or entanglement.

The following avoidance and mitigation measures are proposed:

– Progressive contaminant quality surveys and analysis of the fines in the reclamation material batches (volumes) prior to use in construction to confirm it is largely benign and inert, and it does not pose a material contamination risk to the marine environment.
– During construction of the reclamation area visual photographic monitoring will be carried out to monitor potential turbidity impacts to BCH with management measures to reduce/eliminate unacceptable turbidity effects as described in Section 4.3.6.
– Post-construction surveys of water quality (neap and/or slack tides) and sediment quality will be carried and compared to relevant MEPA and HEPA criteria (see below for definitions of MEPA and HEPA). Any exceedances relative to the pre-construction (baseline) survey may be from the effects of construction and reported to the EPA.
– Construction vessels will:

- Follow relevant Australian and international regulations, including MARPOL Marine Orders and Sewage Prevention Pollution Certificate. All hazardous materials will be stored with secondary containment, with continuous bunding or drip trays around machinery or equipment with the potential to leak hazardous materials
- Have current MARPOL-compliant Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP – for noxious liquids)
- Have Planned Maintenance System for equipment and machinery to avoid any unplanned discharges to the marine environment
- No discharge of untreated sewage or unmacerated food wastes
- Non-toxic chemicals will be used preferentially
- Store all wastes on-board and transfer to the mainland for disposal at a licensed facility as per the construction vessel's Waste Management Plan
- Have waste containers (bins etc.) for waste containment that are clearly marked and suitably covered to prevent material being blown overboard

– Onshore waste management procedures during construction will be as those for the wharf during operations (see below).
– Spill Contingency Plan (SCP) to manage spills in the marine environment that may occur during construction or operations
– Spatial delineation of operational zones of moderate (MEPA) and high (HEPA) ecological protection areas will be defined. The spatial extent of the MEPA will incorporate the floating wharf with a buffer of 50 m. Beyond the MEPA will be a HEPA classification. No low ecological protection area (LEPA) is established because no planned discharges are part of the proposal. The spatial representation of the MEPA and HEPA are illustrated in Figure 4.9.
– During the operational phase the following will be carried out:
  - WQ monitoring will be carried out during slack neap tides twice per year (wet and dry seasons) and compared to relevant MEPA and HEPA criteria. Any exceedances will need to be demonstrated to occur naturally, or if due to operations then rectified to the satisfaction of the EPA.
  - Sediment quality monitoring will be carried out every two years and compared to relevant MEPA and HEPA criteria. Any exceedances, if due to operations will need to be managed to the satisfaction of the EPA.
– Vessels during the operational phase will be subject to the same management measures as construction phase vessels.
– Waste management procedures on the wharf during operations will include:
  - Waste containers on the wharf (bins etc.) will be clearly marked and suitably covered to prevent material being blown into the marine environment. Wastes will be appropriately disposed of on the Island or transferred to the mainland for disposal at a licenced facility
  - Hazardous materials stored on the wharf (e.g. marine gas oil, diesel, hydraulic fluids etc.) will be stored in self-bunded tanks or in drums within bunded and covered areas
  - Sewage will be transferred to the airfield septic tank system
  - Putrescible wastes will be disposed to the current licenced landfill
  - Waste hydrocarbons will be removed from the Island for reprocessing. Wastes that cannot be disposed onsite will be transferred to the mainland by barge for disposal.

The planned activities are unlikely to significant impact conservation significant marine fauna as:

– There is no known critical habitat for any species within the bay and no species are known to permanently reside in the bay
– The large tidal ranges will result in rapid dispersion of any suspended material released outside of the reclamation
– All wastes will be managed to ensure that there is no release to the marine environment
– Potential hazardous materials will be stored and handled according to applicable legislation

– Any accidental spillages or releases of wastes or discharges will quickly disperse due to the large tidal range of the area.

Introduction of invasive marine species

Vessels and marine equipment will be required during construction and operation. Invasive marine species can be carried by the vessel in ballast tanks, biofouling on the hull and internal systems, and in sediments collected around marine equipment. A successful translocation of an invasive marine species could out-compete the existing benthic communities.

The planned activities are unlikely to significant impact conservation significant marine fauna as:

– There is no known critical habitat for any species within the bay and no species are known to permanently reside in the bay
– Local construction vessels will be used to reduce the likelihood of translocating marine pests from high risk geographical areas.

Marine fauna interaction

The physical presence and movement of construction vessels and reclamation of the bay has the potential to impact marine fauna. Impacts may range from behavioural (e.g. changes in surfacing patterns, swimming speed, duration underwater) to injury (e.g. propeller lacerations) or mortality (e.g. vessel strike, crushed by rocks).

During normal operations, there could be up to seven vessel movements to and from the Island per week. Vessel movements have the potential to cause behavioural effects (e.g. changes in surfacing patterns, swimming speed, duration underwater) to injury (e.g. propeller lacerations) or mortality (e.g. vessel strike) to marine fauna.

Ship movements associated with the adjacent mine have occurred since 1951. Operational activities associated with ship movements to and from the Supply Base will incrementally increase vessel movements but will not introduce any new impacts.

The planned activities are unlikely to significant impact conservation significant marine fauna as:

– There is no known critical habitat for any species within the bay and no species are known to permanently reside in the bay
– The number of vessel movements will not be significant
– Marine fauna identification posters and Marine Fauna Sighting Datasheets will be made available on-board construction vessels
– Trained crew will maintain vigilant observation for marine cetaceans or turtles during construction activities and operational vessel movements
– In accordance with Part 8 of the EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area
– In accordance with EPBC Act Policy Statement 2.1 Part A (DEWHA 2008), during rock dumping activities:
    - Precaution zones will be implemented (Observation (3+ km), Low Power (1 km) and Shut down (500 m))
    - Pre-start up visual observation of precaution zones (>30 minutes before soft start)
    - Rock dumping will not commence if cetaceans or turtles are within low power or shut-down zone
    - Trained crew will maintain vigilant observation for marine cetaceans and turtles within precaution zones and vessel planned path throughout rock dumping activities
    - Rock dumping will cease if cetacean or turtle enters shut-down zone
    - Relevant crewmembers are briefed on EPBC Act Policy Statement requirements, soft start, start-up delay, operations and stop work procedures, nighttime and low visibility procedures.

Noise emissions

During construction, underwater noise will be generated by vessel operations including propellers/thrusters and associated machinery/engines, and the reclamation process. During operations, underwater noise will be generated by vessel operation and workshop activities.

Ship movements and ship loading activities associated with the transfer and transport of iron ore from the island have occurred since 1951. Further, mining activities below sea level have occurred at the adjacent mine since 2007, which has involved construction of a sea wall and rock revetment and blasting of material.

Operational activities associated with ship movements to and from the Supply Base will result in an incremental increase in potential underwater noise but will not introduce any new impacts.

Underwater noise has the potential to adversely affect marine fauna and in extreme cases cause physiological harm. Underwater noise may impact marine fauna by:

– Causing behavioural changes including displacement from biologically important habitat areas (such as feeding, resting, breeding, calving and nursery sites)
– Masking or interference with other biologically important sounds such as communication or echolocation systems used by certain cetaceans for navigation and location of prey
– Causing physical injury to hearing and other internal organs
– Indirectly impacting predator or prey species.

The planned activities are unlikely to significant impact conservation significant marine fauna as:

– No species are known to permanently reside in, or close to, the bay
– No piling is required
– No dredging is required
– The number of vessel movements will not be significant
– Trained crew will maintain vigilant observation for marine cetaceans or turtles during construction activities and operational vessel movements
– In accordance with Part 8 of the EPBC Regulations (Vessels), all vessels must travel at less than 6 knots and minimise noise within the caution zone of a cetacean (150 m radius for dolphins, 300 m for whales) known to be in the area
– In accordance with EPBC Act Policy Statement 2.1 Part A (DEWHA 2008), during rock dumping activities:
    - Precaution zones will be implemented (Observation (3+ km), Low Power (1 km) and Shut down (500 m))
    - Pre-start up visual observation of precaution zones (>30 minutes before soft start)
    - Rock dumping will not commence if cetaceans or turtles are within low power or shut-down zone
    - Trained crew will maintain vigilant observation for marine cetaceans and turtles within precaution zones and vessel planned path throughout rock dumping activities
    - Rock dumping will cease if cetacean or turtle enters shut-down zone
    - Relevant crewmembers are briefed on EPBC Act Policy Statement requirements, soft start, start-up delay, operations and stop work procedures, nighttime and low visibility procedures.
– Extension of the airstrip will involve blasting to level the area. Blasting activities will result in vibration being transmitted through the ground, which has the potential to impact the cave located approximately 600 m to the north-west of the Proposal. Although it is unknown whether this cave is affected by the tidal movements (i.e. partially or completely fills with water) and/or is utilised by any bat species (including the Ghost Bat), there is the potential for blasting to result in temporary disturbance to any roosting species. This risk of this disturbance occurring is considered to be low.

Light emissions

Operations could occur 24 hours a day and navigational and safety lighting will be required that may affect marine fauna behaviour.

Continuous lighting in the same location for an extended period may result in alterations to normal marine fauna behaviour such as:

– Disorientation of turtle hatchlings (Environment Protection Authority 2010)
– Disorientation of nesting turtles (Environment Protection Authority 2010)
– Attraction of some seabirds to illuminated structures or the attracted food sources (Marquennie *et al*. 2008).

The planned activities are unlikely to significant impact conservation significant marine fauna as:

– Vessel or wharf spot lights not required for safety purposes will be turned off or directed inboard or towards land at night
– Non-safety lights to be shielded and pointed inboard/at the deck/landward
– The embayment is not a known turtle rookery and hatching site due to continued disturbance since the 1950's.

5.5.3 Listed Migratory Species

Terrestrial species

A review of the Significant Impact Guidelines (DotE 2013) was undertaken to consider potential impacts to Migratory birds. These species are nomadic and highly mobile, utilising habitats as required. For the six migratory bird species previously recorded on Cockatoo Island, there is no important habitat that occurs within the Proposal area or which is likely to be impacted by the Proposal.

The Whimbrel, Common Greenshank and Gull-billed Tern are wading and open water species, and much of the available habitat to wading and shorebird species is restricted to the northern side of the island and will not be impacted by the proposed works. In addition, the Eastern Osprey and Lesser Frigatebird are highly mobile and would opportunistically utilise the Proposal area for foraging. No suitable nesting habitat for these species will be impacted by the proposed works

None of the species discussed are likely to rely on the habitats present within the Proposal area and clearing of habitat for the Proposal is unlikely to significantly impact a population of these species.

Marine species

A review of the Significant Impact Guidelines (DotE 2013) was undertaken to consider potential impacts to migratory dolphin and ray species likely to occur within the Proposal area. The Reef and Giant Manta Rays occur along the majority of Australian coastlines, and may occasionally occur in the Proposal area, although there are no areas of important habitat present for these species. Irrawaddy/Australian Snubfin and Indo-Pacific Humpback Dolphins are both widely distributed species, which may opportunistically use the area of the proposed wharf for foraging. All four of these species are unlikely to rely on the habitat present within the Proposal area and disturbance of the marine habitat is unlikely to significantly impact a population of these species.

The discussion on potential construction and operational phase impacts in Section 5.4.2 also applies to marine migratory mammals, sharks, fish and reptile species. The potential to significantly impact a species of conservation significance is considered to be low.

6. Conclusions

6.1 Benthic communities and habitat

The Project will result in the direct loss of 0.54 ha of hard coral and algae, of which 0.3 ha is largely very sparse hard coral. Species are represented in adjacent bays and in higher densities and coverage. Some colonisation by marine species will occur on the fill used for land reclamation and the floating wharves and associated marine infrastructure. As this bay has very little primary producer habitat compared to the adjacent bays, there is unlikely to be a significant impact to local biological diversity and ecological integrity.

6.2 Coastal processes

The new wharf will run parallel to the shoreline and will not significantly affect or interrupt longshore current movements or existing coastal processes.

Any residual impacts on sedimentation, geomorphology, current speeds and patterns will be localised and restricted to the vicinity of the wharf.

6.3 Marine environmental quality

The Proposal does not involve dredging or any planned discharge and is not expected to interrupt longshore current movements or existing coastal processes.

Impacts will be largely confined to the construction phase and limited to the immediate area of construction that is largely dominated by unvegetated sandy environs. Further, due to the large tidal regime and seasonally high rainfall, fluxes in total suspended solids and turbidity are common, ensuring benthic organisms and habitats are adapted to this regime.

There is not expected to be any significant risk to maintaining environmental values of the water, sediment and biota through the construction or operational phases.

6.4 Marine habitat and fauna

Given the proposed mitigation measures, lack of known critical marine fauna habitat in the impacted bay and comparably less benthic communities and habitats than adjacent bays, the Proposal activities are not expected to result in any significant losses of marine fauna. There is the potential for some fauna losses to occur during the reclamation process, but progressive reclamation will allow marine fauna to relocate.

During reclamation, there is likely to be behavioural avoidance of the area but not direct physical trauma. Any impacts to behaviour will be limited to transient individuals near to the activity, as the area is not significant for cetaceans or turtles. Migrating species that may pass through the area will be able to navigate around any point source disturbance.

With adherence to the management controls proposed during the activities, potential impacts are considered low.

6.5 Terrestrial vegetation

The impacts to terrestrial vegetation are based on the loss of 7.37 ha of native vegetation. No Threatened species or communities have been recorded, or are likely to occur on Cockatoo Island and clearing will remove less than 2% of the remaining area of Eucalyptus woodland present across the Island. No conservation significant flora will be impacted.

Drainage will be designed to minimise the risk of impact to downslope vegetation during construction and operations.

6.6 Terrestrial fauna

The Proposal will result the loss of 7.37 ha of habitat for fauna, including foraging habitat suitable for some conservation significant species.

Some direct loss of reptile and SRE fauna will occur because of vegetation clearing and ground disturbance but this is unlikely to affect conservation significant species as most are nocturnal and arboreal and can move away from the disturbance area.

The availability of other suitable habitat on Cockatoo Island and on adjacent islands and the mainland is likely to ensure the survival and continued presence of the conservation significant species recorded.

Potential operational impacts are unlikely to significantly affect fauna presence or diversity.

6.7 Terrestrial Environmental Quality

The proposal has the potential to introduce hydrocarbon contamination through spills as well as mobilisation of contaminants through erosion and runoff.

Given the proposed mitigation measures, no detrimental effects are anticipated to Terrestrial Environmental Quality as a result of the Proposal and the EPA's objectives for Terrestrial Environmental Quality can be met.

6.8 Social surroundings

Impacts to Aboriginal heritage will be avoided. Consultation with Traditional Owners has been and will continue to be undertaken during the construction of the Proposal in order to understand the values present and to minimise impacts. Concerns raised during heritage site surveys, including potential impacts from the loss of heritage values these will be address during final design, construction or operational phases.

Given the remote location of the Proposal Area, no significant impacts to amenity are anticipated.

6.9 Greenhouse Gas

Based on an expected 18-month duration of construction, the annual Scope 1 emissions are 2,254 tCO2e during construction and (including land clearing) and 488 tCO2e/annum during operations (based on 25 year life). This is below the 100,000 tCO2e/annum Scope 1 emissions threshold within the EPA Environmental Factor Guideline – Greenhouse Gas Emissions.

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Appendices

Appendix A

Supporting documents and data

A1: GHD (2025a) Cockatoo Island Multi-User Supply Base Technical Study - Marine Flora and Fauna

A2: GHD (2017b) Desktop BCH LAU Assessment and Bay 1 Visual Assessment

A3: MScience (2011) Cockatoo Island Marine Closure Knowledge Base and Completion Criteria

A4: MScience (2013) Cockatoo Island Barge Wharf Benthic Habitat Survey

A5: M P Rogers and Associates PL (2011) Cockatoo Island Seawall Decommissioning and Closure Plan

A6: GHD (2021) Kimberley Supply Chain Cluster EIA - Phase 2 - Marine Modelling of Coastal Processes and Construction Impacts

A7: MScience (2010) Cockatoo Island Marine Monitoring - Monitoring Survey Reports

A8: Aprasia Wildlife (2009) Fauna Assessment of Cockatoo Island (Desktop Review)

A9: GHD (2014) Cockatoo Island Flora, Fauna and SRE Surveys

A10: GHD (2017a) Cockatoo Island Multi-User Supply Base. Technical Study - Terrestrial Flora and Fauna

A11: Warham (1957) Cockatoo Island Birds

A12: Hallbridge (2024) Cockatoo Island Supply Base – Aerodrome Concept Drainage Design

A13: GHD (2025b) Results of February 2025 Marine Environmental Quality Survey

A14: GHD (2025c) Results of Preliminary Contaminant Survey of Reclamation Fill

A15: Ecologia (2025) Cockatoo Island Multi-Use Supply Base Targeted Fauna And Flora Survey

A16: GHD (2025d) Underwater Noise Impact Assessment

Appendix B

Environmental Management Plans

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