Referral Supporting Document

Onslow Recreational Jetty

ENVIRONMENT
An O2Marine company

CLIENT: Burbury Consulting/Shire of Ashburton

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MARINE

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Important Note

Map coordinate reference system uses GDA94/MGA zone 50 unless stated otherwise. Maps are not to be used for navigational purposes. Positional accuracy should be considered as approximate.

Acknowledgement Of Country

In the spirit of reconciliation O2 Marine Pty Ltd acknowledge that this project is proposed on the lands of the Thalanyji People. We pay our respects to Elders past, present and emerging and recognise their continuing connection to land, sea, culture and community.

ENVIRONMENT
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Executive Summary

The Shire of Ashburton is proposing to construct and operate a recreational jetty at Beadon Point in Onslow, Western Australia. The Onslow Recreational Jetty (the Proposal) will be constructed adjacent to the ruins of an historic jetty and will be used for fishing and other recreational activities. Following the completion of construction, vessel access will not be permitted to access the jetty. Construction of the jetty will be undertaken using piling and there will be some land clearing to allow access to the jetty area.

A short description of the Proposal is presented below.

Table E1: Summary of the Proposal

Subject	Detail
Proposal title	Onslow Recreational Jetty
Proponent name	Shire of Ashburton
Short description	The proposal is for the construction and operation of a recreational jetty at Beadon Point, Onslow, Western Australia. The Proposal will provide a pedestrian jetty alongside the ruins of the historic Onslow Jetty for tourism and fishing. The jetty will not be designed to accommodate vehicles or vessels, and will be for pedestrians only. Some land clearing will be required to allow a boardwalk access path to the jetty.

Key environmental factors

The key environmental factors identified as relevant for the Proposal are:

- Benthic communities and habitats
- Marine environmental quality
- Marine fauna
- Social surroundings

The potential impacts identified for each key environmental factor are summarised in the table below with details of the proposed management measures and outcomes.

Table E2: Summary of potential impacts, proposed mitigation and outcomes

Key Environmental Factor	Benthic Communities and Habitats (BCH)
Environmental Protection Authority (EPA) Objective	To protect benthic communities and habitats so the biological diversity and ecological integrity are maintained
Policy and guidance	EPA Western Australia Environmental Factor Guideline: Benthic Communities and Habitats. EPA Western Australia Technical Guidance – Protection of Benthic Communities and Habitats
Potential Impacts	The jetty construction may lead to direct loss of BCH at piling locations (minor loss)

	There may also be some loss of BCH due to shading from the jetty once constructed.
Mitigation	Implementation of the Marine Construction Environmental Management Plan including: • Implementation of visual monitoring for sediment plumes and deploying silt curtains if necessary • Undertaking construction activities efficiently to minimise disturbance
Outcomes	The piling from construction is small in scale, and the BCH assessment within the area showed the substrate within the development envelope is predominantly bare sand and rocky reef, with small areas of macroalgae and therefore impacts to BCH will be minimal. Environmental Protection Outcomes for BCH for construction include: • Direct disturbance from construction activities is confined to the development envelope • No detectable impacts to BCH outside the development envelope Based on the predicted small direct loss and small indirect loss of habitat from shading it is considered that the Proposal will not contribute to cumulative loss of BCH such that biological diversity and ecological integrity are at risk. The Proponent considers that the EPA's Objective for BCH can be met.
Key Environmental Factor	**Marine Environmental Quality (MEQ)**
EPA Objective	To maintain the quality of water, sediment and biota so that environmental values are protected
Policy and Guidance	EPA WA Environmental Factor Guideline: Marine Environmental Quality. EPA WA Technical Guidance: Protecting the quality of Western Australia's Marine Environment
Potential impacts	Piling and construction activities have the potential to: • Increase turbidity and suspended sediment concentrations due to piling and vessel movements (minor impacts)
Mitigation	Implementation of the Marine Construction Environmental Management Plan including: • Visual monitoring during construction for sediment plumes
Outcomes	Environmental Protection Outcomes for BCH for construction include: • No residual changes to MEQ as a result of Proposal activities Piling is unlikely to release sediment into the water column, however monitoring will decrease the likelihood as well. During operations, there are no activities that are likely to disturb the sediments. Hydrocarbon or waste spill into the environment has a low likelihood during construction and very low during operations. The Proponent considers that the EPA's Objective for MEQ can be met.

Key Environmental Factor	Marine Fauna
EPA Objective	To protect marine fauna so the biological diversity and ecological integrity are maintained
Policy and Guidance	EPA WA Environmental Factor Guideline: Marine Fauna EPA WA Environmental Assessment Guideline 5, Protecting Marine Turtles from Light Impacts Commonwealth of Australia National Light Pollution Guidelines for Wildlife including Marine Turtles, Seabirds, and Migratory Shorebirds
Potential Impacts	Piling activities have the potential to cause: • Disturbance and general avoidance of the area by marine fauna • Underwater noise impacts leading to behavioural change, injury or death • Physical injury or death caused by vessel strike • Loss of marine fauna habitat due to direct removal or disturbance of benthic habitat A jetty structure may also have the potential to create a barrier for marine fauna such as sawfish to travel along the shoreline, however the design of the jetty on piles allows for water and fauna movement underneath it.
Mitigation	Implementation of the Marine Construction Environmental Management Plan including: • Implementation of Marine Fauna Observers during piling activities • Undertaking piling during times of the year that avoid humpback whale southern migration
Outcomes	Construction impacts would generally be minor and temporary. Some impacts such as those relating to underwater noise emissions have the potential to be significant, however, noise modelling and assessments of significance prepared for threatened species in accordance with EPBC guidelines (DoE 2013) have shown these are unlikely to be significant. The outcome for Marine Fauna is 'no reports negative impacts on marine fauna attributable to the Proposal'. With the proposed management measures the Proponent considers that the Proposal will not result in significant impacts to Marine fauna and the EPA's Objective can be met.

Key Environmental Factor	Social Surroundings
EPA Objective	To protect social surroundings from significant harm.
Policy and Guidance	EPA WA Environmental Factor Guideline: Social Surroundings EPA WA Guidance EIA of Social Surroundings – Aboriginal Cultural Heritage
Potential Impacts	• Disturbance of Aboriginal Heritage places within the landside development area during construction activities • Restricted access to culturally significant Aboriginal Heritage places during construction phase of the Proposal • Temporary closure of the coastal public walkway

	• Restricted access for the public, including recreational fishers, to Beadon Point during landside development and jetty construction • Construction activities increasing dust and noise pollution disrupting residents and visitors of Onslow.
Mitigation	• Having a Thalanyji Traditional Owner representative present during construction activities, particularly if digging is required to monitor the works • The Aboriginal Cultural Heritage listed site 6618 (DEW TALU) encompasses all the landside development envelope, and the intertidal zone of the marine environment. Therefore, traditional owners should also be present through the construction of the jetty within the intertidal zone. • Clearly communicate the Proposal and any beach closures prior to the commencement of construction to all stakeholders • Clearly mark out closed areas required for construction activities.
Outcomes	Construction impacts would generally be minor and temporary. Stakeholder consultation will continue to be undertaken and any beach closures will be temporary in nature. The proposed environmental outcome for social surroundings is 'no reported complaints from the general public associated with the Proposal'.

Acronyms and Abbreviations

Term	Full term
ACH	Aboriginal Cultural Heritage
AHIS	Aboriginal Heritage Inquiry System
ANZG	Australian and New Zealand Guidelines
AHD	Australian Height Datum
BC Act	*Biodiversity Conservation Act 2016 (Western Australia)*
BCH	Benthic Communities and Habitats
BIA	Biologically Important Area
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CD	Chart Datum
CSMF	Conservation Significant Marine Fauna
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment
DAWR	Department of Agriculture and Water Resources
DBCA	Department of Biodiversity, Conservation and Attractions
dB	Decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DE	Development Envelope
DEE	Department of Environment and Energy
DEWHA	Department of Water, Heritage and the Arts
DGV	Default Guideline Value
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EEPL	Exotic Environmental Pests, Weeds and Diseases
EIA	Environmental Impact Assessment
EP Act	Western Australian *Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EQG	Environmental Quality Guidelines

Term	Full term
HAT	Highest Astronomical Tide
IMP	Introduce Marine Pest
ISQG	Interim Sediment Quality Guidelines
IUCN	International Union for the Conservation of Nature
Km	Kilometre
LAT	Lowest Astronomical Tide
LoR	Limit of Reporting
m	metres
MCEMP	Marine Construction Environmental Management Plan
MEQ	Marine Environmental Quality
MFO	Marine Fauna Observer
MNES	Matters of National Environmental Significance
MOF	Material Offloading Facility
NAGD	National Assessment Guidelines for Dredging
NWS	Northwest shelf
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulfate Soils
PEC	Priority Ecological Communities
PEIA	Preliminary Environmental Impact Assessment
PMST	Protected Matters Search Tool
PoA	Port of Ashburton
PSD	Particle Size Distribution
PTS	Permanent Threshold Shift
RSD	Referral Supporting Document
TEC	Threatened Ecological Community
TEQ	Terrestrial Environmental Quality
TN	Total Nitrogen
TOC	Total Organic Carbon
TRH	Total Recoverable Hydrocarbons
TP	Total Phosphorus
TPH	Total Petroleum Hydrocarbons

Term	Full term
TSS	Total Suspended Solids
TTS	Temporary Threshold Shift
WA	Western Australia

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1. Introduction

1.1. Proposal description

The Shire of Ashburton (the Shire) propose to build a new Onslow Recreational Jetty (the Proposal) at Beadon Point, northwest of the main township of Onslow, Western Australia (WA). The regional location and an indicative Proposal Development Envelope (DE) is shown in Figure 1. The location has previously been used as a jetty site in the past, and remains of the Onslow Jetty are still present. The historical Onslow Jetty was used for ships importing building equipment and general merchandise and exporting wool, shell, and minerals through Onslow. It was originally built in 1925, rebuilt in 1934 following cyclone damage and then fell into disrepair when an alternative landing was constructed in Beadon Creek in 1972. Onslow Jetty was then destroyed in an Army explosives exercise in 1982 (Shire of Ashburton 2024).

The proposed jetty will be a pedestrian accessible fixed jetty design, intended to provide access for deeper water fishing at low tide, with usage limited to walking and recreational fishing with no vehicle or vessel access (except for ad-hoc maintenance vehicles/vessels). It will be located adjacent to the remains of the historic Onslow Jetty, which will be able to be viewed from the proposed jetty (remains are visible to the east of the Proposed jetty location shown in Figure 1). In order to access the jetty, some land clearing will also be required within the development envelope.

Figure 1: Proposal Location and indicative Development Envelope

1.2. Scope and objectives

This document provides an assessment of the potential environmental impacts and management measures associated with the Proposal and will be used to support the Proposal's referral to the Western Australian Environmental Protection Authority (EPA).

This Referral Supporting Document (RSD) has been prepared in consideration of the EPA's Instructions on how to prepare an Environmental Review Document (EPA 2024). It provides information on the proposal design and characteristics, local and regional setting, key stakeholders, potential environmental impacts, residual impacts and proposed mitigation measures associated with the construction and operation of the Proposal.

1.3. Proposed construction works

Bunbury Consulting prepared concept designs for the Shire (Figure 2 and Figure 3). A summary of this information is provided below.

The concept work indicates that the seaward end of the jetty will have a "T" shaped end (Figure 3) and split into 2 levels, with a lower landing running parallel to the main jetty to provide greater functionality to the jetty (main jetty will be concrete with lower landing constructed from permeable grated decking to limit uplift loads) (MP Rogers & Associates 2020). The main deck level will be at +8 m Australian Height Datum (AHD) with the lower-level platform down to +2 m AHD (final levels to be confirmed following detailed metocean analysis). It is envisaged that this would provide a reasonable level of access to the water during the full tidal range in this area. It is estimated that most of the jetty would have at least 0.5 m of water depth over 50% of the time with the jetty head is positioned to be within water at Lowest Astronomical tide (LAT) (MP Rogers & Associates 2020).

Modifications to this concept are expected as the preliminary design is finalised to address additional planning and engineering considerations (e.g. costing, constructability and availability of materials); however, these modifications are expected to be minor.

The jetty will be constructed using piles driven into the sediment and landings constructed. Currently there are no roads or access to the site, and therefore land clearing is likely to be required to gain access for the building materials and equipment. A small excavator may also be required to track over the seabed at low tide within the development envelope to facilitate pre-drilling at the pile locations in the event of pile refusal. It is unlikely this will be needed but has been considered for the Proposal as an option.

Construction may be built from the land and progressively work seaward using a mobile construction rig that is moved along the jetty as the structure is progressively built (preferred approach). The additional weight from a mobile construction setup will need to be considered during design (MP Rogers & Associates 2020). A secondary construction option is to build a small temporary access structure from the landside over the beach and intertidal zone.

Construction schedule will be determined by avoidance of key marine species ecological windows. Marine piling will not be undertaken between August and February to avoid humpback southern migration and peak turtle nesting periods, and construction activities that require works or disturbance on the beach will not be undertaken between October and February to avoid peak turtle nesting.

1.3.1. Alternative options considered

A range of bathymetry, tidal and oceanographic studies were considered and discussed with the Shire to inform optimal jetty design and location whilst reducing overall environmental impact (MP Rogers & Associates 2020).

The Shire considered constructing the Proposal in an alternative location near the Onslow Caravan Park to enable the Jetty to extend into deeper water with a shorter deck length. However, it was decided that the Proposal should be constructed at the site of the historical Jetty (Cardno 2017) (Figure 1).

In order to minimise maintenance over the design life of the structure, erosion hazard lines were also assessed as shown in Figure 3. One option was to build the jetty abutment to reach the 2070 erosion hazard line, with the jetty extending seaward from there. However, the jetty would need to be significantly longer to enable it to extend far enough offshore to reach an adequate depth for fishing (potentially increasing the construction costs). The alternative option chosen in discussions with the Shire, was to position the jetty abutment at the 2040 erosion hazard line. This option allows the jetty to extend further seaward for a given budget and effectively increases the length of the structure that is in contact with the water. The jetty abutment for this option would potentially be exposed to some level of risk of coastal erosion over the long term. However, the probability of occurrence of this erosion is likely to be low, though difficult to assess as it is dependent on the severity and frequency of storm events and other factors. This risk could be managed by implementing regular coastal monitoring and undertaking maintenance measures (e.g., construction of abutment protection or an additional landward extension of the jetty) if ongoing erosion becomes an issue in the long term.

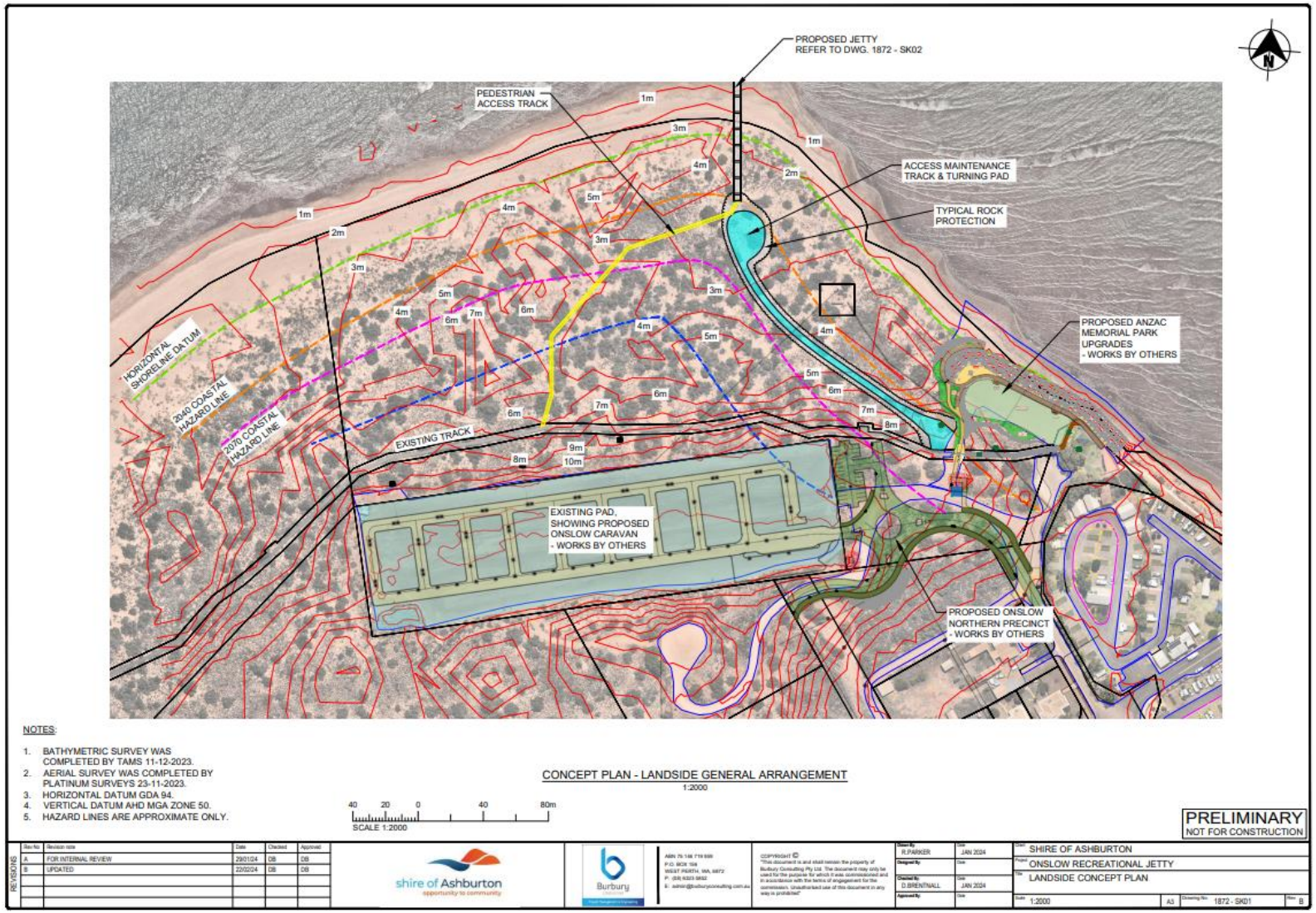

Figure 2: Concept design plan (Burbury Consulting 2024a)

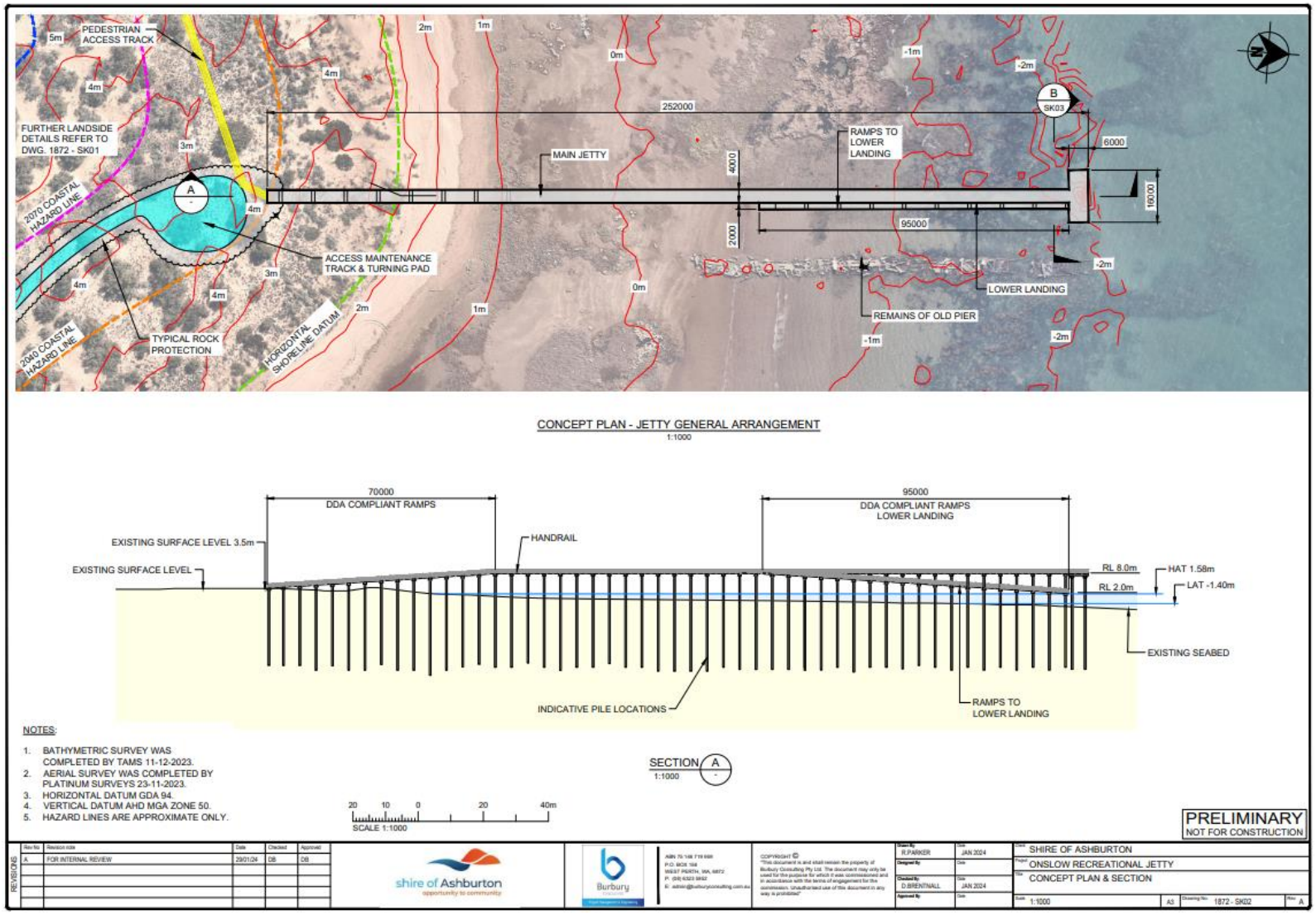

Figure 3: Jetty Concept Design (Burbury Consulting 2024b)

2. Legislative context

2.1. Environmental impact assessment process

This Proposal will be referred to the Western Australian Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act). The EP Act is the primary legislation that governs environmental impact assessment (EIA) and environmental protection in WA. The EPA has prepared administrative procedures for the purposes of establishing the practices of EIA.

Proposals likely to have a significant impact on the environment are required to be referred to the EPA under Section 38 of the EP Act.

EIA is the process for evaluating a proposal and its effects on the environment. It also considers opportunities for avoidance, minimisation, rehabilitation and offset of environmental effects. The EIA process extends from the initial concept of a proposal (including proposal alternatives) through implementation to completion, and where appropriate, decommissioning. The EPA conducts EIA in five stages:

1. Referral of a proposal to the EPA
2. EPA decision to assess a referred proposal
3. Assessment of the proposal
4. EPA report on assessment of the proposal
5. Ministerial decision on the proposal.

Any actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES) are required to be assessed under the Commonwealth *Environmental Protections and Biodiversity Conservation Act 1999* (EPBC Act). This includes internationally important flora, fauna, ecological communities and heritage places. During the preliminary EIA process for this Proposal, the Proponent determined that it was unlikely that the Proposal would have a significant impact on MNES, and therefore would not be referred to the Commonwealth.

2.2. Other approvals and regulation

2.2.1. Land clearing permit

Following the EPA Chairman's determination of the level of assessment for the Section 38 referral, a works approval under Part V Division 2 of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations) will also be sought for the land clearing to allow for vehicle access and the completion of the boardwalk for pedestrian access to the jetty. The works approval will indicate that clearing of native vegetation is required and the Department of Water and Environmental Regulation DWER will then validate the application and inform the Shire of Ashburton if:

- the clearing may be dealt with through conditions on the works approval
- An exemption is available for the clearing, or
- A clearing permit application is required.

If a clearing permit application is required this process will also be undertaken prior to the commencement of clearing.

2.2.2. Decision-making authorities and processes

A summary of the decision-making authorities and processes associated with the Proposal are given in Table 1. These include decisions which may involve environmental impact as a consequence of the Proposal.

Table 1: Summary of decision-making processes and authorities for the Proposal

Environmental impact	How is the impact regulated by other decision-making processes?	Limits of the decision-making processes to regulate the impact (e.g. time limits, excluded operations)	Likely environmental outcome of decision-making processes, and consistency with EPA objectives	Conditions and enforcement, and review process required by decision-making process(es)	Stakeholder engagement and in decision-making processes
Terrestrial Flora and Vegetation Vegetation clearing will be required within approximately 1.4ha for access to the jetty for pedestrians and construction vehicles and for rock armouring of the jetty abutment.	Part V Division 2 of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations)	This process will be relevant to the terrestrial vegetation clearing and not to the marine component.	The EPA objective 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained' will be achieved.	Part V Division 2 of the EP Act can apply conditions to clearing activities, if deemed to significantly impact the environment.	Stakeholder engagement with DWER will continue throughout the process. Further information on stakeholder engagement is provided in Section 3 of the RSD.
Marine Environment Impacts to marine fauna have the potential to occur as a result of Proposal construction and/or operation.	Jetty Licence – Jetties Act	Under the Jetties Act 1926 (Jetties Act), the DoT is responsible for issuing jetty licences for construction, maintenance and operation of private, commercial and community jetty use.	Detailed design and lighting plans will be provided to the DoT for approval as part of the Jetty licensing. Approval of jetty licence will be separate to the Part IV environmental approvals.	The Jetty Licence will contain standard conditions for management and operation.	Stakeholder engagement will be undertaken with DoT throughout the process.

Environmental impact	How is the impact regulated by other decision-making processes?	Limits of the decision-making processes to regulate the impact (e.g. time limits, excluded operations)	Likely environmental outcome of decision-making processes, and consistency with EPA objectives	Conditions and enforcement, and review process required by decision-making process(es)	Stakeholder engagement and in decision-making processes
	Threatened species and ecological communities authorisations under S40 of the BC Act (DBCA)	Under section 40 (1), the Minister or the Minister's delegate may by instrument, authorise a person (including a public authority) to take or disturb a threatened species. This would relate to marine fauna in particular,	An approval under S40 (1) has already been approved for the geotechnical studies for the Project, and therefore it is likely that given the management actions to be undertaken in accordance with the MCEMP, risks to threatened species are manageable and the permit would be approved.	The MCEMP will be provided with the application, and it is likely that the conditions will reflect the management actions already proposed, particularly for the avoidance of impacts to turtles on the beach.	Stakeholder engagement with DBCA will continue throughout the process.
Marine and Terrestrial environments	Development Application (DA) conditions – issued by Shire of Ashburton	This will be relevant to the development but is dependent on the environmental approvals process for regulation of impacts.	The DA approval will inform other secondary approvals such as building permits and jetty licence and is separate to the Part IV environmental approvals	DMA (Shire of Ashburton) DA Approval conditions The DA approval would likely contain conditions for the implementation of management measures consistent with the RSD.	Stakeholder engagement will continue to be undertaken with DMAs through the DA process including internally within Shire of Ashburton.

Environmental impact	How is the impact regulated by other decision-making processes?	Limits of the decision-making processes to regulate the impact (e.g. time limits, excluded operations)	Likely environmental outcome of decision-making processes, and consistency with EPA objectives	Conditions and enforcement, and review process required by decision-making process(es)	Stakeholder engagement and in decision-making processes
		The PD Act governs development and planning in the context of land-use zoning throughout Western Australia and outlines the consultation with relevant authorities			

2.2.3. State Legislation

In addition to the EP Act approvals, the other key State statutory legislation relating to the Proposal are as follows:

- *Port Authorities Act 1999*
- *Biodiversity Conservation Act 2016* (BC Act)
- *Navigable Waters Regulations 1958*
- *Shipping and Pilotage (Port and Harbour) Regulations 1966*
- *Western Australian Marine Act 1982*
- *Pollution of Waters by Oil and Noxious Substances Act 1987*
- *Marine and Harbours Act 1981*
- *Fisheries Resource Management Act 1994* (the State Act addressing Introduced Marine Pests)
- *Aboriginal Heritage Act 1972*

2.2.4. Commonwealth Legislation

The Federal statutory legislation relating to the Proposal are outlined below:

- *Protection of the Seas (Prevention of Pollution from Ships) Act 1983*
- *Australian Ballast Water Management Requirements Version 7 2017*
- *Biosecurity Act 2015*
- *Biosecurity Regulations 2016*
- *National Water Quality Management Strategy (Commonwealth Government of Australia 1992).*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*

2.2.5. Key Guidance documents

The key guidance documents that have been considered in this environmental impact assessment include the following:

- *Environmental Factor Guideline – Benthic Communities and Habitats*
- *Technical Guidance – Protection of Benthic Communities and Habitats*
- *Environmental Factor Guideline – Marine Environmental Quality*
- *Technical Guidance – Protecting the Quality of Western Australia's Marine Environment*
- *Environmental Factor Guideline – Marine Fauna*
- *Environmental Factor Guideline: Flora and Vegetation.*
- *Technical Guidance: Flora and Vegetation surveys for environmental impact assessment*
- *Environmental Factor Guideline: Terrestrial fauna*
- *Technical Guidance: Sampling of short range endemic invertebrate fauna*
- *Technical Guidance: terrestrial vertebrate fauna surveys for environmental impact assessment*
- *Environmental Factor Guideline: Terrestrial environmental quality*
- *Environmental Factor Guideline – Social Surroundings*
- *Matters of National Environmental Significance Significant Impact Guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999*

- National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. Commonwealth of Australia (2020).

3. Stakeholder engagement

3.1. Key stakeholders

The key stakeholders identified for this Proposal include the following:

- Thalanyji Traditional Owners
- Buurabalayji Thalanyji Aboriginal Corporation (BTAC)
- Mineral Resources Limited
- The Onslow Community
- Onslow Visitors Centre
- Ashburton Anglers
- Onslow Chamber of Commerce and Industry (OCCI)
- Australia's North West (ANW)
- Recfishwest

Social surroundings have been identified as a key environmental factor, and therefore further information is provided in Section 10 of this document.

3.2. Stakeholder identification and engagement process and outcomes

Thalanyji Traditional Owners and BTAC have been engaged in undertaking an Aboriginal and ethnographic survey over the Proposal area, with a summary of the results of this survey provided in Section 10.3.1 of this document.

In developing this project, the Shire of Ashburton has worked with a number of partners to obtain funding and ensure the project delivers on its intended outcomes. These include:

- Mineral Resources who are working with the Shire to ensure the community is sustainable, with the development of the tourism industry being a key tool.
- Onslow Visitors Centre – the volunteers at the Onslow Visitors Centre have worked with the Shire to provide information about the feedback from visitors, their preferences and opinions and anecdotal data to help to develop this project. The Centre will work with the Shire to ensure the project meets visitor needs and is well marketed to visitors to Onslow.
- Ashburton Anglers Inc - the body representing recreational fishers within the town of Onslow. They have joined with the Shire to assist in the scoping and design of the project to ensure it meets the needs of recreational fishing. In a letter of support for the project, Ashburton Anglers detail their support and state,

  > "Recreational fishing has been proven to have great economic, social, and mental health benefits throughout Western Australia. The replacement of the Onslow jetty represents a great opportunity to local businesses and community members alike. The Ashburton Anglers see this potential asset as a great addition to recreational fishing infrastructure within the town."

In addition to the above project partners, the Shire has consulted with the below organisations, who are all supportive of the project and have provided letters of support.

- The Onslow Chamber of Commerce and Industry. OCCI details in its letter its support for the proposal:

  "The Chamber supports the proposal to develop the new jetty infrastructure as it sees the benefits for developing tourism product in the Town site of Onslow that will lead to additional tourism visitations and extra night stays in the town. A facility such as that proposed would continue to develop the town's vision as a tourism destination and provide stimulus for small business in the town through its development while also providing opportunities for local small business an opportunity to provide works and services to its development."

- Australia's North West (ANW). As the peak tourism marketing body for the Pilbara and Kimberley regions, Australia's North West Tourism has been consulted in the development of the project to ensure it aligns with efforts to increase tourism to the Pilbara. ANW provided their support for the project, stating,

  "Onslow is a key tourism destination within our region and the new jetty will enhance its appeal to potential visitors, and especially within the key self-drive demographic that is so important to the region's tourism industry. Creating an additional tourism product that enhances Onslow's strategic advantage of its beautiful beachfront and foreshore will aid in achieving our aims of increasing visitor numbers to the region, extending their length of stay and therefore the economic benefit to the local community. In addition to the appeal of Onslow itself, the town serves a role as a departure point for iconic West Australian experiences including the nearby Mackerel Islands and Karijini National Park."

- Recfishwest - the recognised peak body representing the interests of the one in three Western Australians who go fishing every year. They support the Onslow Jetty project, saying:

  "Recreational fishing is an integral part of the coastal Pilbara lifestyle and a key driver of visitation to the region, attracting visitors from around the state and country. Therefore, any improvement in recreational fishing opportunities and facilities within the region is likely to deliver social and economic benefits to the Onslow community. Recreational fishing in Western Australia is an integral part of the WA lifestyle and with an estimated 750,000 Western Australians going fishing every year it is arguable the largest participation sport in WA. In addition to the numerous health and wellbeing benefits of fishing recent studies have shown recreational fishers inject $2.4 billion dollars into the WA economy every year making fishing a vital economic driver for many regional centres."

4. Existing environment

The Proposal will be located at Beadon Point, on the western side of the town of Onslow, Western Australia.

4.1. Climate

Located in the Pilbara, Onslow experiences two seasons: a dry season between April and October and wet season between November and March. The dry season is characterised by warm temperatures with the average daily minimum and maximum temperatures of 14.3℃ and 26.1℃ respectively (BoM 2024). The wet season is characterised by hot temperatures, long sunny days (with more than 10 hours of sunlight per day), and variable rainfall (BoM 2024). February holds the average monthly maximum temperature and highest rainfall (35.3℃ and 86 mm). The coolest average monthly maximum temperatures are experienced in July (25.4℃), with the lowest average rainfall in October (0.8mm) (BoM 2024). Onslow is often impacted by cyclones as the Pilbara is the most cyclone prone area along the Australian coastline (DPIRD 2016). Cyclones are attributed as the source of 25 34% of the total annual rainfall (DPIRD 2016). The annual mean rainfall for Onslow is 328.8 mm. In the wet season, winds are typically stronger and from a southwest, west, or northwest direction creating a sea-breeze effect (DoT 2017).

4.2. Geology and geomorphology

The Pilbara coast is described as a riverine coastal plain in a tropical arid setting. The Onslow coast lies at the western end of the Pilbara and is part of the Carnarvon Basin facing northeast (Semeniuk 1993). The modern shore is developed on Quaternary sediments overlying Tertiary sedimentary rocks at shallow depth. The geomorphic structures of the coastline reflect the repeated rise and fall of sea level and repositioning of the coastline during that period, and the modern complex coastal geomorphology and habitats are a direct outcome of those events reflecting historic environmental conditions, centuries or millennia before present (Eliot et al 2013; Semeniuk 1993). In places the riverine sediments have been lithified. Along with old reef structures and beach rock, these now form coastal limestones outcropping along the shore (O2Marine 2017). More mobile sediments are intermittently delivered to the coast by numerous rivers and flowing streams, the largest being the Ashburton (adjacent to the Proposal), Fortescue and De Grey Rivers (Eliot et al 2013).

Nearshore sediments are predominantly silty sandy substrate that extends out seaward to the 10 m isobath (which extends at least 10 kilometres (km) offshore) (O2Marine 2017). The offshore bathymetry is characterised by a wide continental shelf that extends out to the Exmouth Plateau further characterising shallow bathymetry along the North-West Shelf (DEWHA 2007).

4.3. Tidal Regime

Numerous islands (Muiron Islands, Serrurier Island, Thevenard Island, and Barrow Island) influence waves and tidal currents in the area. Tidal regimes in the Onslow area are semi-diurnal but also experience a monthly spring-neap cycle, a bi-annual cycle due to movement of the solar equator and a

4.4-year cycle developed from lunar elliptic motion with a mean spring tide range of 1.9 m and a neap tide range of 0.5 m (Baird 2020; Damara 2010). The seasonal variations of tides, surges and mean sea level do not generally occur in phase:

- Tidal peaks occur near the equinoxes in March and September
- Surge peaks mainly occur in January to March due to tropical cyclones, and from June to August due to mid-latitude systems
- The seasonal mean sea level peaks during April.

This relative timing means that there is opportunity for high water level events (>2.8 m Chart Datum (CD)) over most of the year. The relative timing of the tidal and mean sea level peaks provides increased potential for extreme water level events to occur as a result of late season tropical cyclones, in March or April (Damara 2010).

Currents are predominately influenced by the Leeuwin Current that flows from south along the WA coastline (DEWHA 2007). The current is driven by the Indonesian Throughflow current, which brings warm water down from the Pacific to the Indian Ocean. The Leeuwin current is strongest during the dry season.

4.4. Waves

Wave conditions are relatively minor due to the shallow bathymetry, with the total wave height lower than 1 m and often less than 0.5 m throughout the year (DoT 2017). Waves along the northwest shelf (NWS) of WA originate from either the Indian Ocean swell, locally generated waves or from tropical cyclones (Baird 2020). During cyclonic events, strong winds can generate extreme wave conditions. The impact of these waves on the Proposal site is dependent on the prevailing water level conditions and the cyclones direction of approach.

4.5. Coastal Processes

The Onslow region is a highly dynamic coastline with both constructional and erosional processes ongoing (URS 2010a). Beadon Point is characterised by low easterly sediment transport (Damara 2010). However, large sediment erosive transport can occur during large storm surges that can accompany tropical low pressure and cyclone weather systems (Cardno 2017). For example, tropical Cyclone Vance in 1990 resulted in erosion at the western end of town beach (Cardno 2017). A seawall was constructed in 2002 running from the western end of town beach to Cameron Avenue to prevent the erosion inundating property and infrastructure. The beach width at the northern end of town beach is narrow with much of the sediment transported through eastern longshore sediment transport.

To maintain longshore sediment transport around the nearby Port of Ashburton (PoA) Material offloading facility (MOF), sand is excavated from a sand-trap on the west of the MOF and trucked to the beach on the eastern side of the MOF. This illustrates sediment transport in the Ashburton area is generally along the shore from west to east (O2Marine 2021a).

4.6. Features of conservation significance

The presence or absence of key features of conservation significance were assessed using the PMST within the search area shown in Figure 4. There were several within and adjacent to the Proposal area that are protected by Commonwealth and State Government legislation, particularly listed species (Table 2). Matters of National Environmental Significance (MNES) are also included in this list. MNES are also discussed further in Section 13. Where there were no features within or adjacent to the Proposal area in the conservation element listed, an approximate distance to the nearest feature has also been presented in Table 2.

Table 2: Outline of distances to the protected conservation significant elements that were not within or adjacent to the Proposal site

Conservation Element	MNES	Approximate Distance (km)	Description
Commonwealth			
World Heritage Areas	Yes	68	The Ningaloo Coast World Heritage Area is the closest World Heritage Area and is located to the west.
National Heritage Places	Yes	68	The Ningaloo Coast is also classed as a National Heritage Place, and is the closest NHP to the Proposal.
RAMSAR Wetlands	Yes	107	Millstream Pools located east of the Proposal site.
Commonwealth Marine Area	Yes	89	Montebello Islands Marine Park located north northeast of Proposal site.
Threatened ecological communities (TEC)	Yes	280	There were none listed within the search area. The only TEC within the Shire of Ashburton is the Themeda Grasslands at Hamersley Station approximately 280 km inland.
Listed Threatened species	Yes	NA	36 listed threatened species including: • 16 bird species • 1 fish species • 5 mammal species • 7 reptile species • 7 shark and ray species
Listed Migratory species	Yes	NA	There were also 50 listed migratory species including: • 27 bird species • 9 mammal species • 5 reptile species • 9 shark and ray species

Conservation Element	MNES	Approximate Distance (km)	Description
Commonwealth Reserves - Terrestrial	-	23	Cane River (Mount Minnie and Nanutarra) Conservation Park located south of the Proposal site
Shipwrecks	-	3	Beadon Creek Shipwreck southeast of the Proposal site
State			
Marine Management Area	-	58	Barrow Island Marine Management Area located northeast of the Proposal site
Marine Park	-	84	Ningaloo Marine Park located west of the Proposal site
National Park	-	114	Cape Range National Park located west southwest of the Proposal site
Nature Reserve	-	20	Thevenard Island Nature Reserve located north of the Proposal site
Important Wetlands in Australia	-	39	Exmouth Gulf East Wetland located west southwest of Proposal site
Significant estuaries	-	7	Coolgra Point is the closest regionally significant mangrove, which is located to the east-northeast of the Proposal site. The Ashburton River Delta is also close-by, located 13 km west southwest of the Proposal site
Fish Habitat Protection Area	-	361	Point Quobba Fish Protection Area located southwest of the Proposal site.

4.7. Key ecological features

Key ecological features are elements of the Commonwealth marine environment that are considered to be of regional importance for either a regions' biodiversity or its ecosystem function and integrity. The Protected Matters Search Tool (PMST; DCCEEW 2024a) provides spatial information about these features and using this tool and the search area as shown in Figure 4 it was found there were no key ecological features that overlap the Proposal area.

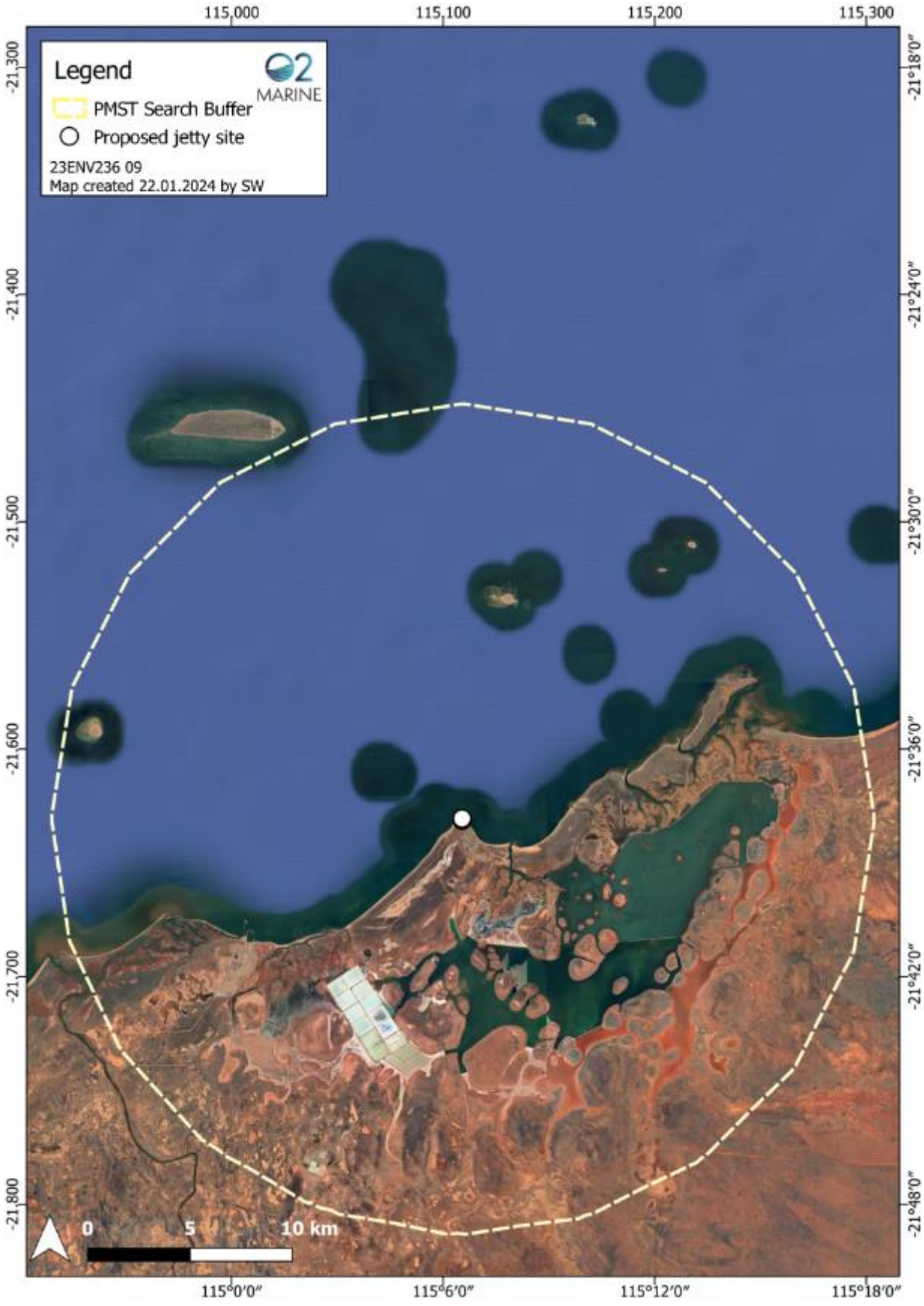

Figure 4: PMST search area with a 20km buffer

5. Object and principles of the EP Act

A summary of how the EP Act principles have been considered in relation to the Proposal is presented in Table 3.

Table 3: EP Act principles and considerations

Principle	Consideration
1. 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 application of this precautionary principle, decisions should be guide by: a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment b) An assessment of the risk-weighted consequences of various options	Consideration of alternatives and the potential impacts of the Proposal have been considered to avoid serious impacts to the environment. Studies and investigations have been undertaken to understand the surrounding environment, including local cultural heritage values, sensitive benthic habitats, areas of high environmental value and conservation significant species. As a result, the proposed location avoids areas of known social, cultural and environmental sensitivity. The jetty design also minimising impacts to sensitive marine fauna and coastal processes.
2. The principle of intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	The Proposal will provide a recreational jetty for the town which will attract tourists and encourage people to visit, potentially leading to new jobs and enhance the value of the area for future generations. The Proposal meets the principle of intergenerational equity by ensuring the health of the environmental values, maintaining ecological functions for future generations, whilst minimising any impacts on the environment. The Proposal is unlikely to results in any significant environmental impacts that would pose a threat to the health, diversity and productivity of the environment.
3. The principle of the conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration	The potential and cumulative impacts of the proposed activities on biological diversity and ecological integrity have been considered and discussed in relation to the following key environmental factors: • Benthic communities and habitats • Marine environmental quality • Marine fauna • Social surroundings

	The Proposal is located within an area historically modified with ruins of the heritage jetty still present, and the areas of land to be disturbed has also been modified. The small scale of the Proposal also means it is unlikely to impact on the biological diversity and ecological integrity of the region.
4. Principles relating to improved valuation, pricing, and incentive mechanisms i. Environmental factors should be included in the valuation of assets an services ii. the polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement iii. 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 waste. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and response to environmental problems.	Funding for the construction of the jetty will be provided by Mineral Resources Pty Ltd, however the Shire of Ashburton will be responsible for implementing the Proposal. Avoidance and minimising impacts to environmental factors was critical to the final proposed design and location as outline in this referral. The Proposal is not expected to generate any significant pollution or waste. Where possible, the Proposal will: • Employ appropriately trained local personnel and source local goods and services • Ensure leading best practice standards during construction to minimise emissions and discharges as far as reasonably possible • Source goods and services that have the least environmental impact.
5. 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	Waste generated by the Proposal will be minimised through the implementation of the hierarchy of waste controls: reduce, re-use, recycle, recover and dispose.

6. Environmental factors and objectives

6.1. Identification of key environmental factors

A preliminary EIA was undertaken in early 2024 to identify the knowledge gaps and preliminary key environmental factors for the Proposal. Based on this desktop assessment, further environmental studies were undertaken, and Table 4 summarises the likely key environmental factors for this Proposal. Justification for these are also provided in further sections, as referred to in Table 4.

Table 4: identification of key environmental factors and justification for each

Environmental factor	Justification
Benthic communities and habitats	This has been identified as a key environmental factor. Further details are provided in Section 0.
Coastal Processes	Coastal processes is not considered a key environmental factor. Further details are provided in Section 11.
Marine environmental quality	This has been identified as a key environmental factor. Further details are provided in Section 8.
Marine fauna	This has been identified as a key environmental factor. Further details are provided in Section 9.
Flora and vegetation	This is not considered a key factor. Further details are provided in Section 11.
Landforms	This is not considered a key factor. Further details are provided in Section 11.
Subterranean fauna	This is not considered a key factor. Further details are provided in Section 11.
Terrestrial environmental quality	This is not considered a key factor. Further details are provided in Section 11.
Terrestrial fauna	This is not considered a key factor. Further details are provided in Section 11.
Inland waters	This is not considered a key factor. Further details are provided in Section 11.
Air quality	This is not considered a key factor. Further details are provided in Section 11.
Greenhouse gas emissions	This is not considered a key factor. Further details are provided in Section 11.
Social surroundings	This has been identified as a key environmental factor. Further details are provided in Section 10.
Human health	This is not considered a key factor. Further details are provided in Section 11.

7. Benthic communities and habitats

7.1. EPA objective

The EPA's objective for the key environmental factor Benthic Communities and Habitats (BCH) is '*To protect BCH so that biological diversity and ecological integrity are maintained*'.

7.2. Policy and guidance

The following EPA guidance has been considered in evaluating the potential impacts on this factor:

- EPA (2016a) Environmental Factor Guideline: Benthic Communities and Habitats.
- EPA (2016b) Western Australia Technical Guidance – Protection of Benthic Communities and Habitats

7.3. Receiving environment

Generally, the surrounding coastline of the Onslow region is comprised of sandy beaches with sand bars and shoals at the mouth of tidal creeks. Beaches are backed by coastal dunes, tidal flats, and limestone barriers and there are also pockets of mangroves lining the fringes of tidal creeks. The intertidal zone along the Beadon Point area is characterised by an extensive limestone pavement and rocky platforms (~300 m wide) partially covered by mud, which transitions to a steep beach slope (URS 2010).

The mid littoral rocky platform is populated by low muddy algal turf with very little invertebrate fauna. However, the lower littoral rock platform has moderately diverse invertebrate fauna, particularly molluscs, with moderate patchy growth of leafy algae and low seagrasses. Some shallow lower littoral pools have small but numerous coral colonies (B 2010a; URS 2010b). The subtidal BCH composition around Beadon Point is dominated by unvegetated sand and silts (O2Marine 2021a).

A string of nearshore reefs forms a chain of shoals along the 10 m isobath to the northwest of Beadon Point. The closest of these reefs is Ward Reef, located 4.5 km northwest of Onslow. Ward Reef has previously been recognised as being regionally important for recreational fishing and conservation values. However, widespread natural disturbance events including coral bleaching have resulted in a previous decline of coral cover by up to 97% at monitored reef locations (Babcock et al. 2020).

A BCH study of the DE has been undertaken for the Proposal (O2 Marine 2024a), which found bare sediment and intertidal reef dominated the study area (39.7% and 38.5% respectively). BCH cover was low, with low cover macroalgae and seagrass areas covering only 0.8% and 0.1 % of the area respectively. Except for oysters in the lower tidal zone, the intertidal area was largely devoid of encrusting or surface-dwelling marine flora and fauna due to the wide range of tidal inundation (~4.5 m) and associated impacts from exposure and desiccation. Within the DE, no seagrass habitat was identified with bare sediment and intertidal reef the main habitat types (28.4 and 58.8 % respectively) (Table 5). The full report is provided in Appendix A.

Table 5: BCH types within the study area and within the development envelope

	Area within the Study area		Area within the Development Envelope	
Classification	Area (ha)	Area (%)	Area (ha)	Area (%)
Bare sediment	1.40	39.7	0.16	28.4
Intertidal reef	1.36	38.5	0.34	58.8
Subtidal reef	0.49	13.9	0.04	6.4
Rock rubble	0.13	3.7	0.008	1.4
Sessile invertebrate assemblage	0.07	2.0	0.005	0.8
Coastal dune	0.04	1.1	0.014	2.4
Macroalgal assemblage	0.03	0.8	0.009	1.5
Low cover seagrass	0.005	0.1	0	0
Terrestrial vegetation	0.002	0.1	0.002	0.3
Total	3.53	100.0	0.578	100

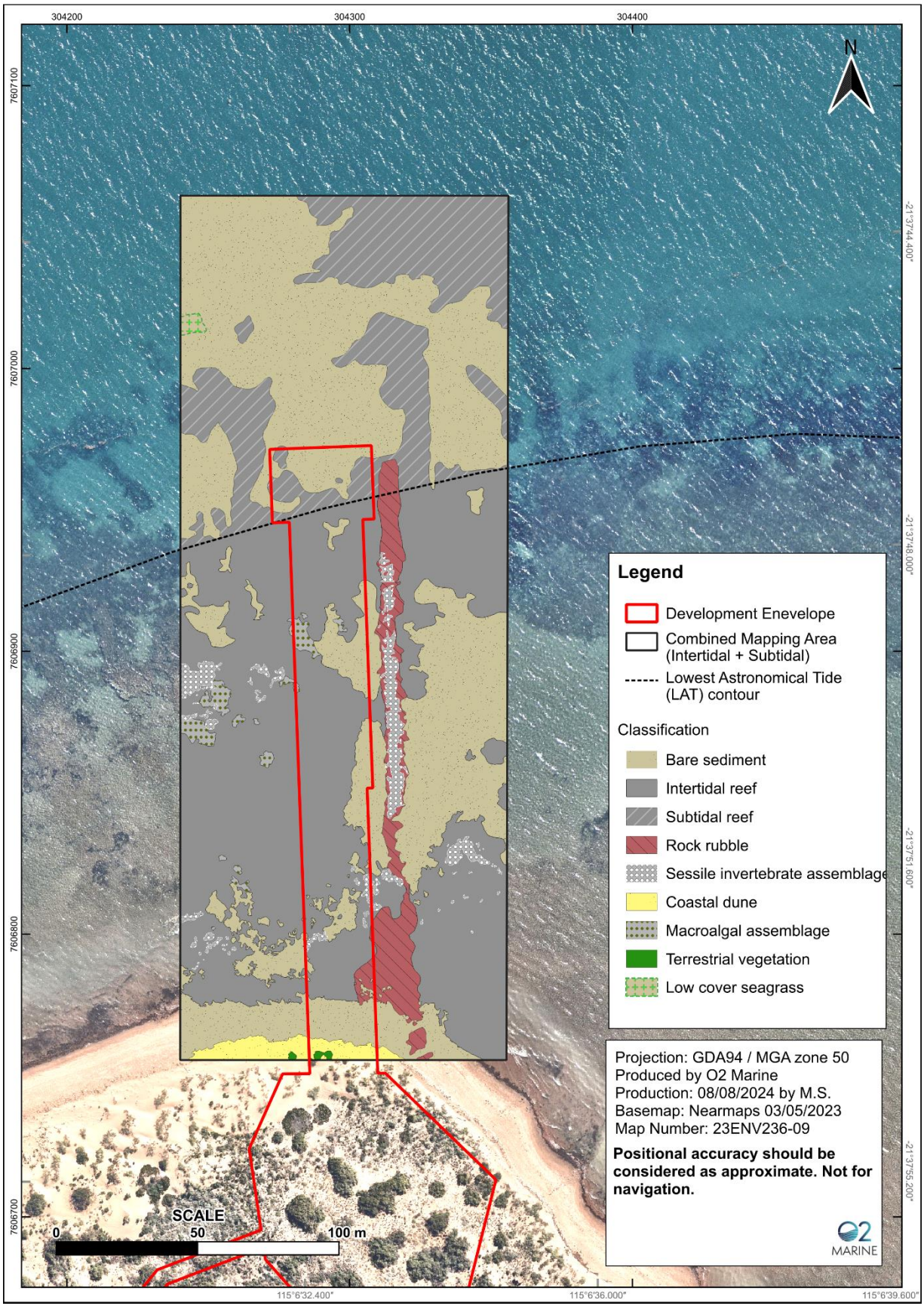

Figure 5: BCH map of the Proposal Development Envelope (O2 Marine 2024a)

7.4. Potential environmental impacts

Activities from the Proposal involving piling, construction and operations of the Jetty may have impacts to BCH. Potential impacts on BCH associated with the Proposal may include, but are not limited to:

- Direct loss of BCH from pile installation and/or disturbance to the sea floor.
- Temporary or permanent shading of BCH under the jetty structure leading to decrease light availability.
- Indirect impacts to BCH from the effects of increased localised turbidity during construction activities resulting increased total suspended solids (TSS), reduced light and sediment deposition (burial), which in turn may lead to sub-lethal impacts or irreversible loss of BCH. It should be noted that piling does not generally generate an increase in suspended sediment, though other construction activities may, depending on the methods used.
- Introduction of invasive marine species from construction equipment and jetty structure creating a new niche for introduced marine pests to be established.
- Accidental hydrocarbon or waste spillage from vessels and vehicles affecting local benthic communities during construction activities.

7.5. Mitigation

Construction of the jetty will have some unavoidable direct irreversible impacts to BCH due to the placement of the piles and the shading of the jetty during operations. However, the site chosen is mainly rocky reef and sand, with very little BCH presence, and therefore minimising the impacts to BCH. In addition to this, the piles may also provide additional artificial surfaces for BCH to grow and accumulate.

In order to ensure impacts are minimised, construction activities will be undertaken in accordance with the Marine Construction Environmental Management Plan (MCEMP) (O2 Marine 2024b). This includes:

- Implementation of visual monitoring for sediment plumes and deploying silt curtains if necessary
- Undertaking construction activities efficiently to minimise disturbance

7.6. Assessment and significance of residual impact

7.6.1. Direct impacts

There will be a direct loss of substrate (approximately 0.0049 ha over the entire DE) due to the piling required for the jetty. The proposed development envelope encompasses a small area (0.04 ha) of subtidal reef which supports a moderate to high cover of mixed assemblages of suspension feeders, hard corals, and macroalgae, and a macroalgal assemblage of 0.009 ha, however the rest of the area (0.529 ha) is bare sediment, reef or rubble which does not support BCH. Therefore, BCH loss will be negligible.

It is also important to note that the new piles will create artificial hard substrate for new benthic communities to colonise, with the piles on the existing wharf structure supporting significant and diverse filter feeder, invertebrate and benthic primary producer communities that clearly tolerate the level of shading that is experienced under the wharf. Therefore, although some small direct loss is

unavoidable and the extent of additional shading from the expansion works will increase the overall impacts to BCH are considered negligible.

7.6.2. Indirect impacts due to increased turbidity

Piling works are expected to result in temporary, localised increase in turbidity, generally within 5 to 20 m from the pile location. The majority of the jetty is also being constructed within shallow waters and therefore the increased turbidity is likely to be less than 20 m. The marine waters of the Proposal area are naturally turbid due to strong tidal currents, especially during spring tides Therefore, it is expected that any increase in turbidity from piling above ambient background conditions would be quickly dissipated.

The BCH present in the Proposal area and surrounding environment is adapted to highly turbid conditions and the rocky reef systems present in the Proposal area do not support benthic primary producers which may be susceptible to elevated turbidity. As such this impact is predicted to be very minor and temporary and is unlikely to represent a significant impact to BCH.

With the mitigation measures set out in the MCEMP (O2 Marine 2024b) invasive marine species and spills of hydrocarbons or waste are also unlikely to cause any indirect impacts to BCH in the area.

7.7. Environmental outcomes

The proposed environmental protection outcomes for BCH are:

- Direct disturbance of BCH from construction activities is confined to the development envelope
- No detectable impacts to BCH outside the development envelope.

These environmental outcomes have been used to develop the management targets and monitoring and management of construction activities in the MCEMP (O2 Marine 2024b).

8. Marine environmental quality

8.1. EPA objective

The EPA objective for marine environmental quality (MEQ) is 'To maintain the quality of water, sediment and biota so that environmental values are protected'.

8.2. Policy and guidance

The following EPA guidance has been considered in evaluating the potential impacts on this factor:

- EPA (2016c) Environmental Factor Guideline: Marine Environmental Quality.
- EPA (2016d) Technical Guidance: Protecting the quality of Western Australia's Marine Environment.

8.3. Receiving environment

8.3.1. Water quality

Various water quality surveys have been carried out in the greater Onslow area surrounding the Proposal site (Wenziker et al 2006; MScience 2009; MScience 2013; O2Marine 2021b). Generally, metals concentrations have been found to be generally below the limit of reporting and therefore also below recommended Environmental Quality Guidelines (EQGs) applied. For example, MScience (2013) results indicated that the water quality guidelines for 99% and 90% species protection (ANZG 2018) for all metals (except possibly Zn) were suitable for application to the waters around Onslow.

Nutrient concentrations in previous studies were generally below the recommended EQGs (ANZG 2018) though total nitrogen and phosphorus exceeded the EQGs at a number of inshore and offshore sites sampled (MScience 2009; O2 Marine 2021b). Ammonia has also exceeded the EQGs in a small proportion of samples previous undertaken (O2 Marine 2021b).

Samples analysed for hydrocarbons (BTEX, TPHs, and PAHs) have been consistently barely detectable in the previous investigations in the area (Wenziker et al 2006; MScience 2009; MScience 2013; O2Marine 2021b).

Turbidity and salinity baseline data have been generally higher than guideline values, and overall exhibit high natural variability (O2 Marine 2021b).

8.3.2. Sediment quality

A sediment assessment of potential constituents and contaminants including metals, potential acid sulfate soil (PASS), moisture content, total organic carbon (TOC) and particle size distribution (PSD) was undertaken as part of the suite of studies conducted to support the Proposal approvals process (O2Marine 2024c).

A total of 7 randomly positioned sediment samples were collected within the Proposal DE during the field survey, along with a further 2 samples collected for quality assurance and control. Sample site selection, sample collection and storage procedures were undertaken in accordance with the NAGD (2009). The metals results were then compared to the Default Guideline Values (DGVs) defined in ANZG (2018), which align with the recommended interim sediment quality guidelines (ISQG) screening levels in the NAGD (2009). Where DGVs did not exist, results were compared to available baseline concentrations. PASS was also assessed against the guidelines established in DER (2015) to see whether sediment samples had a 'positive field sulphide identification'.

Results indicated all metals except for arsenic were below the ISQG/DGV screening levels. Arsenic has been considered to naturally occur at elevated concentrations in the Pilbara when compared to ambient concentrations determined by previous studies. The moisture content, PSD and TOC of sediments sampled were typical for Pilbara nearshore sediments in the Onslow region. No sites presented a 'positive field sulphide identification', hence, PASS is unlikely to be present. Therefore, it is concluded that any disturbance of sediments associated with the jetty construction is considered unlikely to result in adverse effects to marine living resources, human health, and terrestrial living resources.

8.4. Potential environmental impacts

Activities from the Proposal involving piling, construction and operations of the Jetty may have impacts to MEQ. Potential impacts to MEQ surrounding the Proposal may include but are not limited to:

- Reduction in water quality from release of toxicants or nutrients to the water column due to disturbance of sediments during construction activities that disturb the seafloor
- Minor and temporary reduction in water quality from localised increased turbidity from pile installation
- Accidental hydrocarbon or waste spills from vessels and construction equipment resulting in water and sediment contamination
- Introduction and establishment of invasive marine species from construction equipment and vessels leading to altered ecosystem processes (e.g. nutrient cycling and sedimentation).

In order to allow fishing at the Jetty, the water quality must also meet specific health criteria to ensure seafood is suitable for consumption. These criteria are set out in the Australian and New Zealand Guidelines for fresh and marine water quality (ANZG 2018).

8.5. Mitigation

Piling methods will be chosen based on the final geotechnical information and final designs, however they will also be determined based on the least impact on MEQ. Blasting and drilling may increase the sediment released into the water column, and therefore vibration piling is preferable. Pre-drilling may be required for the piles to be inserted into the rock, and impacts to marine environmental quality will be mitigated through undertaking works during low tide and when the intertidal zone is above water where possible.

Construction activities will also be undertaken in accordance with the MCEMP (O2 Marine 2024b) including having visual monitoring during the construction works to monitor for a visual plume. If a plume is being seen, a silt curtain may be deployed around the work area to trap the sediments within a smaller area.

8.6. Assessment and significance of residual impact

Piling works are expected to result in temporary, localised increase in turbidity, generally within 5 to 20 m from the pile location. Most of the jetty is being constructed within shallow waters and therefore the increased turbidity is likely to be less than 20 m. In addition to this, if sediment plumes are likely then construction may be undertaken during lower tides when the plumes are less likely to spread, and silt curtains will also aid in mitigation as described above. The marine waters of the Proposal area are naturally turbid due to strong tidal currents, especially during spring tides. Therefore, it is expected that any increase in turbidity from piling above ambient background conditions would be quickly dissipated. Sediment sampling also indicates that any sediment released into the water column is unlikely to introduce any contaminants or toxicants above the natural levels.

As such this impact is predicted to be very minor and temporary and is unlikely to represent a significant impact to marine environmental quality.

8.7. Environmental outcomes

The proposed environmental protection outcomes for MEQ are:

- No residual changes to MEQ as a result of Proposal activities

This environmental outcome has been used to develop the management targets and monitoring and management of construction activities in the MCEMP (O2 Marine 2024b).

9. Marine Fauna

9.1. EPA Objective

The EPA's objective for marine fauna is 'To protect marine fauna so that biological diversity and ecological integrity are maintained'.

9.2. Policy and guidance

The following EPA guidance has been considered in evaluating the potential impacts on this factor:

- EPA (2016e) Environmental Factor Guideline: Marine fauna
- EPA (2010) Environmental assessment guideline 5: Protecting marine turtles from light impacts

The following additional guidance has been considered in evaluating the potential impacts on this factor:

- Department of the Environment (DoE) (2013) Matters of National Environmental Significance: Significant impact guidelines 1.1
- National light pollution guidelines for wildlife (DCCEEW 2023a)
- Marine bioregional plan for the North-west Marine Region (DSEWPaC 2012a)
- National Guidelines for the Survey of Cetaceans, Marine turtles and the Dugong (DCCEEW 2024b)
- Recovery Plan for Marine Turtles in Australia (DoEE 2017a)
- National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna (DoEE 2017b)
- Australian National Guidelines for Whale and Dolphin Watching 2017 (DoEE 2017c)

Certain species are also mentioned in threat abatement plans, as these species have been particularly identified as being at risk from these threats. The threat abatement plans and the relevant species for this Proposal are shown in Table 6.

Table 6: threat abatement plans relevant to the Proposal

Threat Abatement Plan	Species
Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE 2018)	• Dugong • Humpback whale • Indo-pacific bottlenose dolphin • Flatback turtle • Green turtle • Hawksbill turtle

Threat Abatement Plan	Species
	• Wedge-tailed Shearwater • Silver gull
Threat Abatement Plan for predation, habitat degradation, competition, and disease transmission by feral pigs (*Sus scrofa*) (DoEE 2017c)	• Flatback turtle • Green turtle • Hawksbill turtle
Threat Abatement Plan for Predation by the European Red Fox (DEWHA 2008)	• Flatback turtle • Green turtle • Hawksbill turtle • Wedge-tailed Shearwater • Lesser Sand Plover
Threat Abatement Plan for Predation by Feral Cats (DoE 2015)	• Hawksbill turtle • Australian fairy tern • Wedge-tailed Shearwater

9.3. Receiving environment

9.3.1. Conservation Significant Species

Conservation significant marine fauna (CSMF) are fauna species listed as Threatened or Migratory under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), or the *Biodiversity Conservation Act 2016 (Western Australia)* (BC Act) as Threatened or Priority Species. The PMST search (methods described in Appendix C) identified the following CSMF as having a 'known' or 'likely' occurrence within the search area:

Known

- Australian humpback dolphin (*Sousa sahulensis*) (Migratory and Cetacean)
- Australian snubfin dolphin (*Orcaella heinshohni*) (Migratory and Cetacean)
- Dugong (*dugong dugon*) (Migratory and Marine)
- Indo-pacific bottlenose dolphin (*Tursiops aduncus*) (Migratory and Cetacean)
- Humpback whale (*Megaptera novaengliae*) (Migratory and Cetacean)
- Hawksbill turtle (*Eretmochelys imbricata*) (Vulnerable, Migratory and Marine)
- Flatback turtle (*Natator depressus*) (Vulnerable, Migratory and Marine)
- Green turtle (*Chelonia mydas*) (Vulnerable, Migratory and Marine)
- Leaf-scaled seasnake (*Aipysurus foliosquama*) (Critically Endangered and Marine)
- Loggerhead turtle (*Caretta caretta*) (Endangered, Migratory and Marine)
- Dwarf sawfish (*Pristis clavata*) (Vulnerable and Migratory)
- Freshwater sawfish (*Pristis pristis*) (Vulnerable and Migratory)

- Green sawfish (*Pristis zijsron*) (Vulnerable and Migratory)
- Reef manta ray (*Mobula alfredi*) (Migratory)
- Australian fairy tern (*Sternula nereis nereis*) (Vulnerable)
- Bar-tailed Godwit (northern Siberian) (*Limosa lapponica menzbieri*) (Endangered and Migratory)
- Bridled tern (*Onychoprion anaethetus*) (Migratory)
- Caspian tern (*Hydroprogne caspia*) (Migratory)
- Common sandpiper (*Actitis hypoleucos*) (Migratory)
- Curlew sandpiper (*Calidris ferruginea*) (Critically Endangered and Marine)
- Eastern curlew (*Numenius madagascariensis*) (Critically Endangered and Marine)
- Eastern osprey (*Pandion haliaetus cristatus*) (Migratory)
- Greater Sand Plover (*Charadrius leschenaultia*) (Vulnerable and Migratory)
- Lesser Crested Tern (*Thalasseus/sterna bengalensis*) (Marine and Migratory)
- Sharp-tailed sandpiper (*Calidris acuminata*) (Vulnerable and Migratory)
- Sooty tern (*Onychoprion fuscatus*) (Marine)
- White bellied Sea Eagle (*Haliaeetus leucogaster*) (Marine).

Likely

- Blue Whale (*Balaenoptera musculus*) (Endangered and Migratory)
- Leatherback turtle (*Dermochelys coriacea*) (Endangered, Migratory and Marine)
- Short-nosed seasnake (*Aipysurus apraefrontalis*) (Critically Endangered and Marine)
- Narrow sawfish (*Anoxypristis cuspidate*) (Migratory)
- Giant manta ray (*Mobula birostris*) (Migratory)
- Grey nurse shark (*Carcharias taurus*) (Vulnerable)
- Scalloped hammerhead (*Sphyrna lewini*) (Conservation Dependent)
- Southern bluefin tuna (*Thunnus maccoyii*) (Conservation Dependent)
- Common greenshank (*Tringa nebularia*) (Endangered and Migratory)
- Lesser frigatebird (*Fregata ariel*) (Migratory)
- Pectoral sandpiper (*Calidris melanotos*)
- Roseate tern (*Sterna dougallii*) (Migratory)
- Streaked Shearwater (*Calonectris leucomelas*) (Migratory).

9.3.2. Biologically important areas

Biologically Important Areas (BIAs) were identified from a search of the PMST (DCCEEW 2024a) and the Australian Marine Spatial Information System (AMSIS) (DCCEEW 2024b). BIAs are spatially defined zones where aggregations of individuals of a particular species are known to display biologically important behaviours such as breeding, foraging, resting or migration (DCCEEW 2024b). BIAs were first identified on a regional basis as they were developed as part of the Commonwealth Marine Bioregional Plans and have been identified using expert scientific knowledge about species' distribution, abundance, and

behaviour in the region, to inform decisions made under the EPBC Act. BIAs that overlap the Proposal area are presented in Table 7.

Nesting and inter-nesting areas identified as habitat critical to the survival of marine turtles are listed for each genetic stock in the PMST search and those that overlap the Proposal area are presented in Table 8.

Table 7: Biologically Important Areas that spatially overlap with all marine elements of the Proposal (DCCEEW 2024b)

Species	Type
Whale	
Humpback whale	Migration (north and south)
Pygmy blue whale	Distribution
Turtle	
Hawksbill turtle	Nesting, Internesting
Flatback turtle	Nesting, Internesting
Bird	
Wedge-tailed shearwater	Breeding
Lesser crested tern	Breeding
Roseate Tern	Breeding
Fairy Tern	Breeding

Table 8: Critical habitat for the survival of marine turtles that overlap the Proposal search area

Species	Type
Flatback turtle	Nesting
Green turtle	Nesting
Hawksbill turtle	Nesting

9.3.3. Key marine fauna species

Key marine fauna species were identified for the Proposal through a Marine Fauna Desktop Assessment as provided in Appendix C (O2 Marine 2024d). The key species for this Proposal are marine fauna identified to have a high likelihood of occurrence and conservation significance within the area are:

- Mammals
    - Australian humpback dolphin
    - Indo-pacific bottlenose dolphin
    - Dugong

- Humpback whale
- Reptiles
  - Hawksbill turtle
  - Flatback turtle
  - Green turtle
  - Short-nosed sea snake
- Sharks and rays
  - Scalloped hammerhead
- Birds
  - Australian fairy tern
  - Bar-tailed godwit
  - Caspian tern
  - Common greenshank
  - Common sandpiper
  - Greater crested tern
  - Eastern curlew
  - Eastern osprey
  - Greater sand plover
  - Grey-tailed tattler
  - Lesser crested tern
  - Red-necked stint
  - Roseate tern
  - Silver gull.

Other species may be infrequently present, and the identification of key species can act as umbrella species –when these species are protected, other species with similar sensitivities will also be indirectly protected. Green sawfish were discussed during a pre-referral meeting with DWER and was assessed within the Marine Fauna Desktop (See O2 Marine 2024c; Appendix C) and considered to have a moderate likelihood of occurrence within the Proposal area, therefore was not considered to be a key species.

Several key species are likely to be present throughout the year; however some species are only present within or near the Proposal area during certain month or seasons. Ecological windows have been identified for those species that are present periodically, and these are presented in Table 9. By referring to these ecological windows and undertaking certain construction activities during certain times of the year (for example piling with underwater noise during times of the year when migrating marine fauna are not present) the impacts can be minimised.

Certain activities of species may also require further management and monitoring considerations due to different impacts, and therefore activities including migrations, nesting, inter-nesting and foraging were presently separately for certain species to be assessed independently.

Table 9: Key Species' Ecological Windows (Dark blue represent- full duration of presence. Light blue – represents timing of specific behaviours. Diagonal shading represents peak timing of specific behaviours)

Species presence	J	F	M	A	M	J	J	A	S	O	N	D	Data Source
Humpback whale*													Irvine and Salgado Kent (2019); Jenner et al. (2010)
Northern migration													Jenner et al. (2010)
Southern Migration													Irvine and Salgado Kent (2019); Jenner et al. (2010)
Southern migration – peak mother calf													Irvine and Salgado Kent (2019); Jenner et al. (2010)
Australia humpback dolphin													Hanf et al. (2022)
Indo-Pacific bottlenose dolphin													Hanf et al. (2022)
Dugong													Hodgson et al. (2008)
Hawksbill turtle													DoEE (2017a)
-Foraging													DoEE (2017a)
-Nesting													DoEE (2017a)
-Inter-nesting													DoEE (2017a)
-hatchlings emerging													DoEE (2017a)
Flatback turtle													DoEE (2017a)
-Foraging													DoEE (2017a)
-Nesting													DoEE (2017a)
- Inter-nesting													DoEE (2017a)
-hatchlings emerging													DoEE (2017a)
Green turtle													DoEE (2017a)

Species presence	J	F	M	A	M	J	J	A	S	O	N	D	Data Source
Foraging													DoEE (2017a)
-Nesting													DoEE (2017a)
-Inter-nesting													DoEE (2017a)
-hatchlings emerging													DoEE (2017a)
Loggerhead turtle													DoEE (2017a)
-Foraging													DoEE (2017a)
-Nesting													DoEE (2017a)
-Inter-nesting													DoEE (2017a)
-hatchlings emerging													DoEE (2017a)
Green sawfish													Bateman et al. (2024); Lear et al. (2023); Morgan et al. (2017)
-Pupping													Lear et al. (2023)
Scalloped hammerhead													Bartes and Braccini (2021); Chin et al. (2017); TSSC (2024)
*-Pupping**													TSSC (2024)
Reef manta ray													Armstrong et al. (2020)
Seabirds													DCCEEW (2024d)
-Nesting across species													DCCEEW (2024d)
Migratory Shorebirds (Non-breeding migration)													DoE (2015a); Bamford et al. (2008)
*Pupping can occur throughout the year but predominantly occurs between October and January/February													

9.3.4. Fish and Fisheries

9.3.4.1. Aquatic Resources

The Proposal is located within the North Coast Bioregion which extends from Onslow to the WA/Northern Territory border. The Department of Primary Industries and Regional Development (DPIRD) manages WA Aquatic Resources which include the ecosystems and their constituent habitats, captured species and listed species, including commercial, recreational, and customary fisheries. Given the complexity of WA Aquatic Resources DPIRD applies an ecosystem-based fisheries management to assess risks using indicator species. Indicator species are used to evaluate the status of an Aquatic Resources and have been selected based on their inherent vulnerability, management importance and overall risk to sustainability.

In the North Coast Bioregion, the main commercial fisheries focus primarily on tropical fish, in particular high-value snappers, cods, and emperors (Newman et al. 2023). There are eight Aquatic Resources that overlap the Proposal area, and within these Aquatic Resources there are 11 managed commercial fisheries that may operate in the waters adjacent to the Proposal area (Newman et al. 2023):

- The Northern Demersal Scalefish Resource has three commercial fisheries; Pilbara Trap Managed Fishery, Pilbara Fish Trawl (Interim) Managed Fishery, and Pilbara Line Fishery that occur within the vicinity of the Proposal. The indicator species are the bluespotted emperor, red emperor and Rankin cod, which are taken both commercially and recreationally.
- The Northern Invertebrate Resource has four commercial fisheries, though the Onslow Prawn Managed Fishery is the only fishery which operational area overlaps the Proposal area. The Proposal area is not heavily used by the fishery, with only one boat fished in the OPMF as the other operators decided they were more likely to more profitable fishing elsewhere. Ashburton Nursery extends to Beadon Point and includes waters ~2.5 km north of the Beadon Point. The fishery has limited recreational catch and indicator species are the western king and brown tiger prawn.
- The North Coast Crab Resource has one commercial that overlaps the Proposal area, namely the Pilbara Crab Managed Fishery. Blue swimmer crabs are the target and indicator species for both commercial and recreational fisheries. This fishery is considered relatively small.
- The Statewide Large Pelagic Scalefish Resource includes a range of commercial, recreational and charter fisheries that utilise a range of tropical and temperate pelagic species. One commercial fishery overlapping the Proposal area which is the Mackerel Managed Fishery. Spanish mackerel and grey mackerel are the indicator species, taken both commercially and recreationally and Spanish mackerel dominates the retained recreational and charter catch. Fishing is generally further offshore than the Proposal area.
- Statewide Hand Collection resource has one commercial fishery that overlaps the Proposal area, being the Western Australian Sea Cucumber Fishery. Commercial fishing primarily operates in the northern half of WA, from Exmouth to the Northern Territory border. Limited recreational and customary fishing occurs.
- Pearl Oyster (*Pinctada maxima*) Resource manages the Pearl Oyster Wildstock Fishery. The fishery targets silver lipped pearl oysters. There is no authorised recreational fishing and customary fishing is concentrated to the West Kimberly region.
- Statewide Marine Aquarium Fish and Hermit Crab Resource manages two commercial fisheries that operate within WA waters: the Marine Aquarium Fish Managed Fishery and the Hermit Crab Fishery. These fisheries are thought to be minor in the area and are more active Capes region, Perth, Geraldton, Exmouth, Dampier and Broome in shallow water (<30 m depth).

- Statewide Specimen Shell Resource manages the commercial Specimen Shell Managed Fishery, and there is no documented recreational fishing of the aquatic resource. Commercial fishing is concentrated adjacent to population centres such as Broome, Exmouth, Shark Bay, Geraldton, Perth, Mandurah, the Capes area, Albany, and Esperance.

Recreational fishing in the North Coast Bioregion generally has a seasonal peak in winter, when significant numbers of intra- and inter-state recreational fishers travel to Onslow, Dampier Archipelago and Broome. These fishers predominantly engage in boat-based fishing. Recreational fishers utilise the numerous creek system, mangroves, rivers, and beaches provide shore and small boat fishing opportunities. Recreational fishers primarily target finfish species such as barramundi, tropical emperors, mangrove jack, trevallies, sooty grunter, threadfin, cods, catfish, and invertebrate species including blue swimmer crabs, mud crabs, and squid (Newman et al. 2023). Shore-based fishing spots are focused on small creek mouths with Beadon Creek being the closest site to the Proposal area (Fishing Spots n.d.).

9.3.4.2. Fish communities

The Onslow area has low to moderate fish abundance, with species richness typically low in the nearshore environment and higher offshore (Kangas et al. 2006; Kangas et al. 2015). The species found in the nearshore environment are predominantly tropical and are short lived with high productivity, resulting in life-history traits of high fecundity and high productivity and high input into reproduction during their relatively short life spans (Kangas et al. 2015). Finfish species caught in the nearshore environment of the North Coast bioregion (Pilbara and Kimberley) are often juveniles that are targeted by commercial and/or recreational fisheries (Newman et al. 2004). As the species mature, they emigrate into the deeper offshore waters where they fished targeted by commercial trawl and trap fisheries (Newman et al. 2004).

9.3.4.3. Aquaculture

There are no aquaculture leases within the Proposal area. The closest aquaculture lease is offshore north of Thevenard Island (DPIRD 2024).

9.4. Potential environmental impacts

Proposal activities including piling, vessel movements, and operations of the Jetty (such as recreational fishing leading to increased waste and the catching of fish in a different area) associated with the Proposal may impact marine fauna species including commercially and recreationally important fish species both directly and indirectly. Potential (direct and indirect) impacts may include but are not limited to:

- Propagation of underwater noise from pile installation of the jetty, which may lead to:
    - Permanent threshold shift (PTS), temporary threshold shift (TTS), or stress response to marine fauna
    - Avoidance of important habitat
    - Injury or mortality, avoidance behaviour and potential displacement of prey.

  Further information on this potential impact is provided in Section 9.4.1

- Construction activities on the beach including moving equipment and materials to the jetty site, possibly leading to disruption of behaviour or even injury or death of marine turtles and disturbance of nests.
- Introduction of invasive marine species from construction equipment and jetty structure creating a new niche for introduced marine pests to be established resulting in:
    - Competition with native species for food and/or habitat, potentially leading to the displacement of native species
    - Predation of native species
    - Alternation of trophic interactions and food-webs
    - Loss of commercial and recreational fisheries harvests
- Proposal vessel movements during construction increasing the chance of vessel strikes that may cause marine fauna injuries, displacement, or death. Further details on this potential impact is presented in Section 9.4.2
- Direct and indirect impacts from artificial light during construction and operations resulting in potential light spills impacts on marine turtles and migratory and marine shorebirds
- Entanglement with marine debris during construction and operations (i.e. fishing gear) resulting in injury or mortality to marine fauna
- Impacts associated with habitat modification, waste or hydrocarbon spills and litter and debris during construction and operations
- Impacts associated with recreational fishing at a different location given the new jetty location.

Particular marine fauna species may also be impacted in different ways, depending on their interactions with their habitat and the stressors associated. These are presented in Table 10 and have also been considered in the impact assessment process.

Table 10: Summary of key species, their habitat and potential stressors related to the Proposal

Species	Key habitats/core use of waters within and adjacent to the Proposal	Potential stressors related to the Proposal
Dugong	Foraging habitat Distribution	• Underwater noise • Vessel strike • Loss or degradation of foraging habitat
Australian humpback dolphin	Foraging habitat	• Underwater noise • Vessel strike • Loss of foraging habitat/prey displacement • Human presence
Indo-Pacific bottlenose dolphin	Foraging habitat	• Underwater noise • Vessel strike • Loss of foraging habitat/prey displacement • Human presence
Humpback whale	Migration, and resting BIA overlap with the Project Potential calving habitat	• Underwater noise • Vessel strike

Species	Key habitats/core use of waters within and adjacent to the Proposal	Potential stressors related to the Proposal
Green turtle	Foraging, nesting, inter-nesting and hatchling habitat	• Artificial light • Hatchling predation • Vessel strike • Underwater noise • Habitat modification • Reduced water quality • Invasive species • Human presence (shoreline activities)
Flatback turtle	Foraging, nesting, inter-nesting and hatchling habitat	• Artificial light • Hatchling predation • Vessel strike • Underwater noise • Habitat modification • Invasive species • Human presence (shoreline activities)
Hawkbill turtle	Foraging, nesting, inter-nesting and hatchling habitat	• Artificial light • Hatchling predation • Vessel strike • Underwater noise • Habitat modification • Invasive species • Human presence (shoreline activities)
Short-nosed sea snake	Distribution, remnant population	• Habitat loss/degradation (coral reefs) • Chemical spills
Scalloped hammerhead shark	Distribution	• Barriers to movement • Habitat loss or degradation • Changes in hydrology
Seabirds	Nesting Breeding Foraging	• Artificial light • Habitat loss or degradation • Invasive species • Human presence (shoreline activities)
Migratory shorebirds	Migration habitat Foraging and roosting	• Artificial light • Habitat loss or degradation • Invasive species • Human presence (shoreline activities)

9.4.1. Underwater noise from piling

Underwater noise is categorised as either being impulsive (with a sudden onset, e.g. piling) or continuous (e.g. part of the ambient, or background soundscape like shipping and dredging). There is unlikely to be an increase in continuous underwater noise attributable to the Proposal as it does not involve dredging and with no vessel access to the jetty, there is no expected increased sources of underwater noise during the operational phase. The Proposal will involve impact hammer piling, which is the most significant noise from the Proposal during the construction phase and has the greatest risk of auditory injury to the species.

Underwater noise has the potential to travel large distances, so potential impacts on marine fauna can be widespread. The degree of impacts from underwater noise is dependent on the sound's duration, amplitude, and frequency, the distance between the sound source, marine species present and the sensitivity of the marine species to the site-specific combination of these factors (Salgado Kent et al. 2016). The potential impacts to marine fauna from underwater noise is presented in Table 11 and Figure 6. From a population conservation perspective, the most significant consequence could be marine fauna behaviour changes like avoidance of critical habitat (e.g. foraging, breeding or resting ground; Figure 7).

Table 11: Potential impacts of underwater noise to marine fauna

Impact/response	Explanation
Permanent threshold shift (PTS)	Permanent reduction in the sensitivity of hearing, decreased ability to detect sound, permanent damage to ear hair cells or attached neurons, irreversible hearing loss, and/or damage to and around hearing structures and haemorrhaging of the ear (Salgado Kent et al. 2016).
Temporary threshold shift (TTS)	Temporary hearing loss or impairment following exposure to high level of noise. Previously been thought of as reversible damage but be irreversible (Kujawa and Liberman 2009; Salgado Kent et al. 2016). TTS can reduce individuals' communication, ability to detect prey or predators and/or assess environment (Popper and Hawkins 2019).
Behavioural	Behavioural responses can vary and include changes in swimming (speed and/or direction), diving (frequency and duration), breathing rates, communication, foraging, mating, resting, socialising, defensive behaviours and/or moving towards or away from the source. Sometimes behavioural responses can result in secondary organ or tissue damage (e.g. rapid rise from a dive or response by moving directly in line with other threats) (Salgado Kent et al. 2016).
Masking	When anthropogenic noise is at a sufficient high level and similar frequency and timing to a signal of interest, it can mask the signal affecting the perception of the signal of interest. Masking is problematic when communication between animals or the ability to sense predators is disrupted.

Impact/response	Explanation
Stress and physiological response	Can occur at long and short ranges (Erbe et al. 2022) and can potentially occur across all the theoretical zones of impact. Stress can include hormonal, autonomic, immune, and behavioural responses (Popper and Hawkins 2019). Prolonged, and repeated stress responses can be deleterious to an individual's health (Purser and Radford 2011; Salgado Kent et al. 2016). The stress response is intended to increase the probability of survival from an immediate threat but prolonged or repeated stress responses can be deleterious to health. Further, stress may also results in the individual spending less time foraging or spawning, which could loss and deterioration in condition (Salgado Kent et al. 2016).

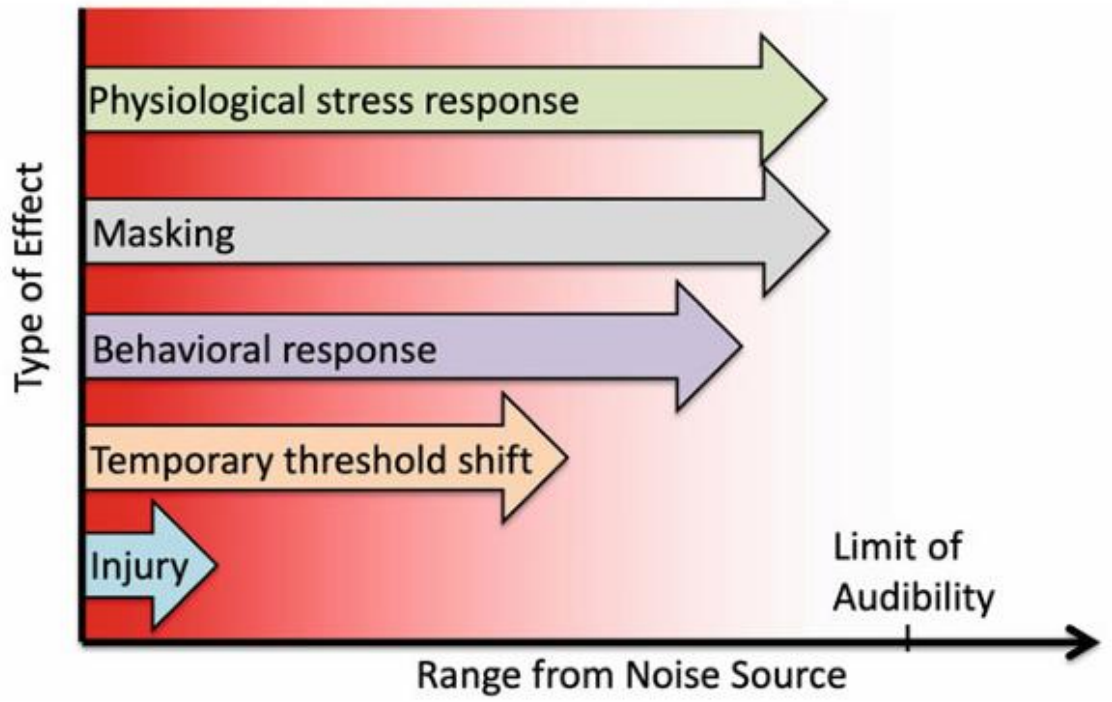

Figure 6: Generalised ranges from a noise source, at which different types of impacts to marine fauna may occur (Erbe 2022)

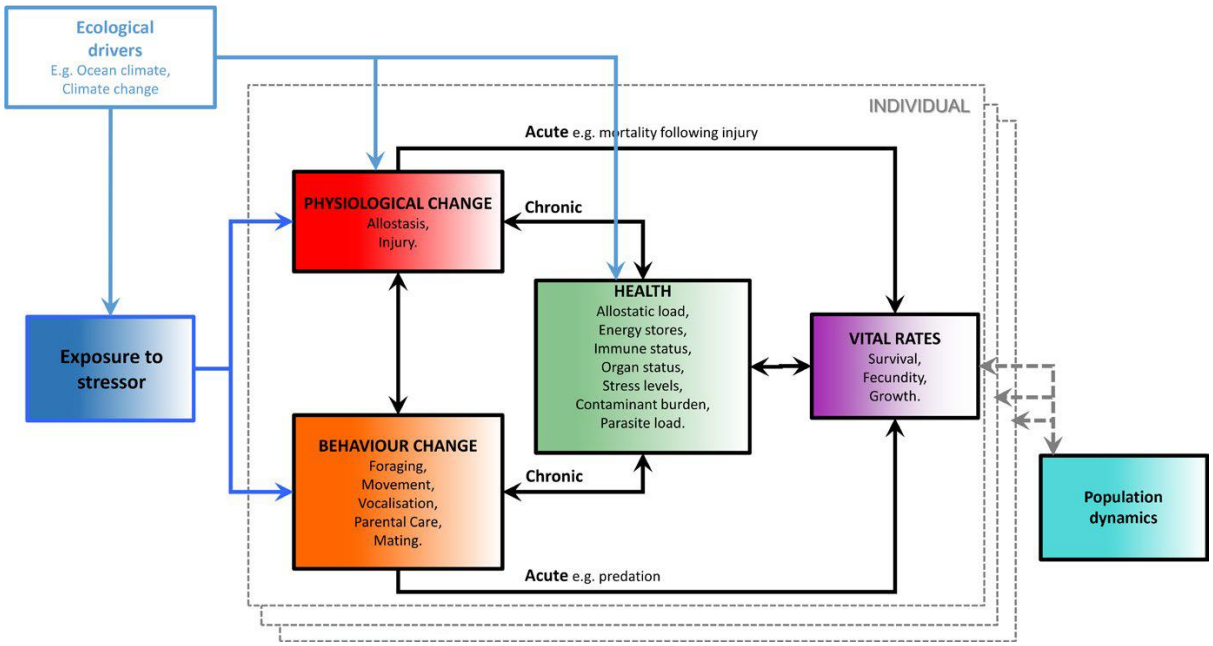

Figure 7: Population consequences of disturbances (PCoD) conceptual framework (Pirotta et al. 2018)

The potential impacts and current knowledge on the effect of underwater noise on key species are discussed below to adequately understand the potential for behavioural change, death or injury for each hearing groups.

Mammals

Marine mammals are highly reliant on underwater sounds, using sound for spatial orientation, communication, foraging, and detecting predators, and therefore are sensitive to changes in ocean soundscapes and anthropogenic noise sources (Haver et al. 2018; Huang et al. 2023). The most significant population level effect from anthropogenic noise, such as pile driving, to marine mammals is more likely to occur from behavioural responses rather than from direct injury or mortality (Parnum et al. 2018). Studies on Indo-pacific bottlenose dolphins' response to pile driving, found the dolphins had a reduced occurrence during pile driving activities (Salgado Kent et al. 2012; Paiva 2015).

Reptiles

Low-frequency sounds, continuous noise sources, overlap with marine turtles hearing ranges and are potentially vulnerable to anthropogenic noise pollution (Willis 2016; Díaz et al. 2024). These lower frequency continuous noise sources can potentially result in behavioural and masking effects (Suedel et al. 2019). Impact noise source effects on marine turtles is not well understood but it is thought that the species generally demonstrate a startled response to impulsive noise, including temporary behavioural response, such as avoidance of an area (McCauley et al. 2000).

The effects of underwater noise on sea snakes are poorly understood but could they potentially respond in a similar way to turtles, such as behavioural avoidance. Sea snakes may also be vulnerable to impulsive noise (i.e. piling noise) due to the species having sealed nostrils and air-filled lungs, which extends the length of their bodies, and their slow swimming speed. Research on the Stoke's sea snake

(*Hydrophis stokessi*) found the species underwater noise sensitivities were most similar to fish species without swim bladders e.g. elasmobranchs, meaning the species may be sensitive to sound pressure. It is unlikely sea snakes would experience injury or mortality from underwater noise but could experience behavioural effects (Parnum et al. 2018).

Sharks and rays

Elasmobranchs (sharks) lack a swim bladder and therefore are thought to be less susceptible to noise sound pressures than other fish species, but instead are more sensitive to the particle aspect of sound, which is a measure of the vibrations (Salgado Kent et al. 2016). Anthropogenic underwater noise exposure can lead to changes in movement patterns, feeding behaviours, social interactions, and antipredator behaviours in bony fish (Chapuis et al. 2019).

Shorebirds and seabirds

Noise travels through water five times faster than it travels through air and therefore the energy or intensity (loudness) of sound is greater in water than in air (Webb 2023). It is unlikely that noise generated by piling in the air will cause significant injury or mortality to bird species, however, may result in temporary disturbance or avoidance, depending on weather conditions. Migratory shorebirds and seabirds are not likely to be directly impacted by underwater noise, but they could be indirectly impacted by effects on their prey species present within the water column.

9.4.2. Disturbance of marine fauna from construction activities

The Proposal will involve construction activities on the beach and within sand dunes, including moving equipment and materials to the jetty site which could lead to disturbance of turtle nesting (i.e. nesting attempts aborted), disturbance of turtle nests, disturbance to migratory shore bird roosting and foraging behaviours, or even injury or death of marine turtles. Human presence at sensitive (i.e. nesting or roosting sites) is a threat of concern for flatback, green and loggerhead turtles, migratory shorebirds, and seabirds (DSEWPaC 2012b; c).

Marine turtles have high nesting beach fidelity, returning to the same beach from where they were born to lay their eggs. Nesting sites are selected carefully as nests can be disrupted by flooding or erosion (as well as feral animals such as cats (DoE 2015), foxes (DEWHA 2008) and pigs (DoEE 2017)). When turtles are onshore for nesting, they are particularity sensitive and can be disturbed by movements (i.e. people walking or driving along beaches) and light (DSEWPaC 2012b)

Further, marine turtles' eggs are buried ~50 cm deep meaning that eggs are susceptible to being crushed by vehicles driving on the beach. Vehicle presence on beaches can also reduce emergence success via compacting sand over nests, eroding dunes (reducing suitable nesting habitat), and/or creating tyre ruts that can impede hatchling's ability to reach the ocean (DoE 2017a).

9.4.3. Habitat loss, degradation and modification during construction

Nearshore and onshore construction activities can physically change the marine environment and have the potential to displace marine species which rely on the on habitats for foraging, nesting, breeding, and other activities critical for their survival (DSEWPaC 2012a). Further, a loss of habitat from the Proposal could indirectly impact marine fauna through starvation, displacement of prey, or even lack

of areas to rest. Human disturbance on the beach may also lead to turtle nesting being affected, emerging hatchlings, or nests being disturbed and eggs potentially broken. As marine turtle clutches of eggs are generally buried close to the surface, half a metre from the surface, they can be impacted by vehicles and human tracks (DSEWPaC 2012b).

Potential impacts from the Proposal may include habitat loss associated with BCH loss for marine fauna, but also disturbance of the beach leading to nesting disturbance. Shorebirds and seabirds may also be affected by the disturbance of dunes and land clearing leading to a loss, reduction or change in roosting, foraging or nesting habitat (DSEWPaC 2012c).

9.4.4. Vessel strike from construction vessels

Marine fauna may be impacted by vessel strike during construction, potentially resulting in injury or death. The North-west Marine Bioregional Plan (DSEWPaC 2012a) identifies strike as a threat of Potential Concern for the humpback whale, Australian humpback dolphin, Indo-pacific bottlenose dolphin, dugongs, hawksbill and green turtles, and a threat of Least Concern for sea snakes (DSEWPaC 2012a). Marine mammals and turtles are susceptible to vessel strike as they are air breathers and known to spend prolonged periods at the surface. Previous studies have found dugongs spend 47% of their time within 1.5 m of the surface and 3.5% of this time they are resting at the surface (Hodgson 2004; CoA 2017b). This same study found calves spend 13% of their time travelling or resting on their mother's back. Vessel and dugong interactions have also been found to increase in shallow waters with large intertidal areas and during low-tide (Groom et al. 2004; CoA 2017b).

The speed that a vessel is travelling has an influence on the extent of injury to fauna, with Laist (2021) finding a significant increase in the risk of vessel collision between marine megafauna and vessels at speeds >10 knots. Speeds >14 knots significantly increase the chance of lethal injury from a vessel collision and the increase in speed of a vessel reduces the ability for dugongs and turtles to flee (Hodgson 2004; DoEE 2017b). Reduced speeds provide greater reaction time and therefore restricting vessel speeds during construction activities would also decrease the likelihood of vessel strike.

Marine fauna exposed to persistent interruptions from vessel movements and noise can also result in disruptions to important behaviours (e.g. feeding, mating, courtship) which can in turn impact the reproductive success and ultimately population levels (Hodgson and Marsh 2007).

9.4.5. Artificial light pollution

Marine species at the greatest risk from anthropogenic lighting are turtles and certain species of avifauna. Light pollution has been identified as a threat of Concern for the flatback and green turtle, and a threat of Potential Concern for shorebirds and seabirds (including wedge-tailed shearwaters) (DSEWPaC 2012a). Artificial light can impact turtle throughout all their life cycle, including nesting adult females and hatchlings (Lohmann et al. 1997; Salmon 2003; Witherington and Martin 2003). A summary of the potential impacts of artificial light pollution is presented below:

- Impacts on recently emerged turtle hatchling impeding sea finding ability from beach. Greater risk of predation.
- Increased hatchling risk to predation through due to increased visibility at night from artificial light.

- Female turtle disturbance during nesting, discouraging turtles to nest on certain parts of the beach.
- Females searching for other parts of the beach may cause nest destruction of other nests.
- Reliance on other beaches for nesting increases vulnerability of a population to environmental change.
- Interactions between seabirds or shorebirds and artificial light sources, causing disorientation or grounding of fledglings.
- Mortality or injury caused from seabird or shorebird collision with artificially lit infrastructure.
- Starvation due to disruptions in the ability of seabirds and shorebirds to forage at sea and onshore.

Unmitigated direct light may illuminate foraging habitat, influencing foraging behaviour, or displacing waterbirds from potential habitat.

9.4.6. Invasive species

An invasive species is one occurring beyond its accepted normal distribution as a result of human activities and which threatens valued environmental, agricultural or other social resources by the damage it causes. Invasive species have been identified as a threat of Concern for the flatback turtle and green, and a threat of Potential Concern for dugongs, shorebirds, and seabirds (including wedge-tailed shearwaters) (DSEWPaC 2012a). Invasive species include both introduced marine pests species and invasive terrestrial species/predators, which could occur during construction and operations.

Introduced marine pests (IMPs) are animals, plants, algae, and other biota that exist in an area outside their natural geographical range, to which they have generally been translocated by human activity. The National Marine Pest Plan 2018-2023 defines IMPs as an introduced species that causes harm to the environment, social amenity, or industry, or have the potential to do so if they were to be introduced, established, or spread in Australia's marine environment (DAWR 2018). Marine pests can be introduced via ballast water exchange or biofouling, and examples of the impacts of introduced marine pests in relation to the Proposal area include:

- Competition with native species for food and/or habitat, potentially leading to the displacement of native species
- Predation of native species
- Alternation of trophic interactions and food-webs
- Loss of commercial and recreational fisheries harvests
- Alteration of ecosystem processes (e.g. nutrient cycling and sedimentation)
- Reduced coastal aesthetics
- Damage to marine and industrial infrastructure
- Reduced aquaculture productivity.

9.4.7. Hydrocarbon spill during construction

Hydrocarbon/oil spills has been a threat of Potential Concern for the dugong, Australian humpback dolphin, Indo-pacific bottlenose dolphin, sea snakes, shorebirds, and seabirds (including wedge-tailed shearwaters) (DSEWPaC 2012a).

In the event of a hydrocarbon spill, there is a risk of marine fauna being exposed to surface oil or ingesting small amounts. The impact on marine fauna is dependent on the extent of the spill and the sensitivity of the receptor. Oil spills can potentially affect all levels of marine life from zooplankton, invertebrates, and vertebrates. Potential impacts to marine fauna relevant to the Proposal may include (Yuewen and Adzigbil 2018):

- Loss and degradation of important habitats (e.g. foraging habitat, nesting beaches, nursery habitats, seagrass and macroalgae nursery habitats, key fishing grounds)
- Mass mortality of fish species (e.g. important recreational and commercial species, loss of important marine fauna prey species)
- Impaired physiological functions such as reduced feeding, growth and development affecting recruitment of species
- Reduced fitness including reproduction impairment and development defects
- Respiration problems
- Loss of locomotion, balance, and swimming abilities.

Hydrocarbon spills may enter the marine environment via construction vessels and equipment. The primary substance from these sources could be diesel and small amounts of hydraulic oil (i.e. from hydraulic failure including o-ring, pipe, fitting), lubricating oil and grease for maintenance of vessel equipment, which may be accidentally spilled during regular vessel activities (i.e. accidental discharge, collision, deck drain and refuelling).

9.4.8. Entanglement/ingestion of marine debris

The injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris is listed as a key threatening process under the EPBC Act. To provide support in how to address this, the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (DoEE 2018) was developed. Species identified within the threat abatement plan are identified in Table 6. Marine debris has been identified as a threat of Concern within the North-west marine bioregional plan for hawksbill, green and flatback turtles, and of potential concern for dugongs, Australia humpback dolphin, and indo-pacific bottlenose dolphin (DSEWPaC 2012a). Sources of waste and marine debris from the Proposal may occur during construction and operational phases, which are discussed in the sections below.

9.4.8.1. Entanglement/ingestion of marine debris during construction phase

General waste is expected with any construction activity and sources of marine debris from the Proposal activities include direct disposal into the marine environment or wind-borne litter from vessels or landside infrastructure. Marine fauna can be impacted by debris entering the marine environment potentially leading to injury or mortality, through entanglement or plastic ingestion.

9.4.8.2. Entanglement/ingestion of marine debris/fishing gear during operational phase

Derelict and active fishing areas are known to pose threats to marine fauna (Nicholson 2023) and interactions with fishing gear can pose a threat to marine fauna including marine mammals, turtles,

sharks, and seabirds (Parton et al. 2019). The impacts of entanglement or ingestion of fishing gear can result in drowning, amputation of body parts, infections, reduced mobility, and reduce ability to forage or engage in other normal behaviour. Recreational fishing gear that is commonly involved in dolphin entanglement includes monofilament and braided fishing line, crab trap float lines, fishing hooks, and other debris (Butterworth et al. 2012; Nicholson 2023). Interactions, including entanglement or ingestions, with fishing gear can occur from active fishing, or from lost or inappropriately disposed of fishing gear (Nicholson 2023). During the Proposals operational phase recreational fishing could potentially impact marine fauna.

9.5. Mitigation

Mitigation measures can be implemented to reduce the likelihood and severity of the potential impacts detailed in Section 9.4. A summary of the mitigation measures to be undertaken for marine fauna is presented in Table 12.

Mitigation of impacts during construction will also be managed through the MCEMP in Appendix E (O2 Marine 2024b).

Table 12: Mitigation actions for the Proposal for Marine Fauna

Marine fauna	Relevant Proposal activity and potential impact	Application of mitigation hierarchy
Construction phase impacts		
Marine mammals Reptiles Sharks and rays	• Injury, death or behavioural response from underwater noise from piling	<u>Avoid:</u> • Avoid piling works during sensitive times including humpback whale southern migration (August to November) and peak turtle nesting (October to February) to take into account ecological windows • Construction (e.g. piling) to occur during day light hours only. <u>Minimise:</u> • Dedicated MFOs for piling (marine piling) • Piling during daylight hours only • Marine piling should aim to avoid high tide where practicable. • Develop and implement Management Zones (Exclusion and Observation Zones) for key marine species based on underwater noise modelling • Develop and implement Management Zones (Exclusion and Observation Zones) for key marine species based on underwater noise modelling • These zones are intended to act as the key mitigation measure for protecting marine fauna and as such need to be designed to prevent TTS and PTS impacts on marine fauna (i.e. i.e. not define the outer boundaries of a threshold exceedance distance per se), therefore, to achieve this outcome, the zones need to be broader than the modelled outputs. • 30-minute pre-start, 30-minute soft-start, shut-down, and low-visibility conditions to be applied.
Reptiles (turtles) Migratory shorebirds Seabirds	• Disturbance to marine turtles and migratory shorebirds on the beach and within the sand dunes from construction works	<u>Avoid:</u> • Construction activities to be undertaken outside of peak turtle nesting periods (October to February) • Construction (e.g. piling) to occur during day light hours only <u>Minimise:</u> • Landside piling to have trained MFOs present to avoid turtle nests

Marine fauna	Relevant Proposal activity and potential impact	Application of mitigation hierarchy
		• Adhere to the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) provide a guide to turtle watching and a turtle watching code of conduct (DBCA 2020a;b) • Movement of equipment etc on the beach will be restricted to a small area rather than travelling along the beach, avoiding dunes as much as possible.
Marine mammals Reptiles Sharks and rays	• Injury or death of marine mammals due to vessel movement (strike) from construction vessels	<u>Avoid:</u> • Avoid piling works during sensitive: • Humpback whale southern migration (August to November) • Construction (e.g. piling) to occur during day light hours only • All construction vessel restricted to max speed of 8 knots within the Proposal area. <u>Minimise:</u> • Piling to occur from land where possible • The Proposal will be completed using a small number of small vessels (e.g. a tender and/or a barge). • Adhere to vessel caution and approach zones within the MCEMP (Appendix D)
Reptiles (marine turtles) Migratory shorebirds Seabirds	• Artificial light pollution during construction	<u>Avoid:</u> • Construction (e.g. piling) to occur during day light hours only • Only install and use lighting as required <u>Minimise:</u> • Construction lighting to be minimal and in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023a) • Use wildlife friendly lights were practicable • Consideration to whether activities requiring illumination (landside construction works) can be undertaken during daylight hours only
Reptiles	• Loss of marine fauna habitat during constructions	<u>Avoid:</u> • Proposal DE to avoid significant marine fauna habitat

Marine fauna	Relevant Proposal activity and potential impact	Application of mitigation hierarchy
Migratory shorebirds Seabirds		Minimise: • Undertake construction operations as efficiently as possible
Marine mammals Reptiles Sharks and rays Migratory shorebirds Seabirds	• Hydrocarbon spills and/or other waste discharge during construction works Injury or mortality to marine fauna and/or loss or degradation of critical or important marine fauna habitat	Avoid: • Ensure all construction vessels are compliant with the International Maritime Organisation International Convention for the Prevention of Pollution from ships (MARPOL) • Construction vessels speeds restricted to 8 knots within the Proposal area, to limit the potential for vessel collisions Minimise: • Ensure all construction vessels and equipment supply and maintain adequate hydrocarbon spill kits on site during construction and within immediate access during refuelling • Implement procedures for safe storage and handling of all hydrocarbons and chemicals
Marine mammals Reptiles Sharks and rays Migratory shorebirds Seabirds	• Entanglement and/or ingestion of marine debris during construction and from public use of the jetty	Avoid: • All waste and rubbish will be appropriately stored and managed to prevent debris and waste from entering the marine environment. Minimise: • NA
Marine mammals Reptiles Migratory shorebirds Seabirds	• Introduced marine pests from construction vessels and equipment	Avoid: • NA Minimise: • All construction vessels to comply with biosecurity requirements • If vessels come from interstate or international waters vessels are required to completed the WA DPIRD 'Vessel Check' risk assessment

Marine fauna	Relevant Proposal activity and potential impact	Application of mitigation hierarchy
		• Where possible construction method to limit the number of vessels required.
Operational phase impacts		
Reptiles Migratory shorebirds Seabirds	• Artificial pollution light during operations	<u>Avoid:</u> • All non-essential lighting to be switched off when not in use <u>Minimise:</u> • Lighting to adhere the National Light Pollution Guidelines for Wildlife (DCCEEW 2023a) • Minimum number of lights to meet occupational health and safety standards • Light installed on the jetty to be solar powered lights..
Reptiles Migratory shorebirds Seabirds	• Habitat modification - jetty structure increasing the risk predation they pose to marine turtle hatchlings, modified shoreline and dunes	<u>Avoid:</u> • Jetty location outside of important habitat for turtles, migratory shorebirds, and seabirds. <u>Minimise:</u> • Lighting to adhere the National Light Pollution Guidelines for Wildlife (DCCEEW 2023a) • Minimum number of lights to meet occupational health and safety standards and utilise solar powered lights

Marine mammals
Reptiles
Sharks and rays
Migratory shorebirds
Seabirds
	• Entanglement and/or ingestion of marine debris operations and from public use of the jetty, including fishing gear
	• Increased waste from public uses and access
		<u>Avoid:</u>
		• All waste will be appropriately stored and managed to prevent marine debris from entering the marine environment.
		<u>Minimise:</u>
		• Educational signage will be installed on the on the jetty advising users of:
		  • Local fauna presence/significance and how to report injured, deceased or sick fauna
		  • Importance of responsible rubbish management, including not allowing fishing line to be disposed into the marine environment where it has the potential to result in fauna entanglement.
		• Jetty infrastructure to be maintained and inspected in accordance with Shire procedures.

Marine fauna	Relevant Proposal activity and potential impact	Application of mitigation hierarchy
Marine mammals Reptiles Sharks and rays Migratory shorebirds Seabirds	• Introduction and establishment of marine pests • Incursion of terrestrial pest species	Avoid: • All waste will be appropriately store and managed to prevent marine debris from entering the marine environment Minimise: • Jetty infrastructure to be maintained and inspected in accordance with Shire procedures, including inspection on marine infrastructure for pests • Shire to maintain current terrestrial pest management

9.6. Assessment and significance of residual impacts

9.6.1. Underwater noise modelling and impacts from piling

Underwater noise modelling was undertaken for the piling activities for the Proposal, to determine the extent of potential impacts on marine fauna (ANV Consultants 2024). Piling was assumed to be hammer piling due to the likely presence of rock and/or limestone within the area. Hammer piling was assessed to be the more conservative approach as vibration piling is likely to have less impact.

The key marine fauna species used for the underwater noise assessment included the following:

- Humpback whale (low-frequency cetacean)
- Australian humpback dolphin and indo-pacific/ spotted bottlenose dolphin (high-frequency cetaceans)
- Dugong (sirenians)
- Sharks, rays, sea snakes and sawfish (fish species without swim bladder)
- Flatback, green and hawksbill turtles.

Underwater noise was identified as a threat of Potential Concern to these species, except for the dugong which was Least Concern however this species was still assessed to be conservative. Underwater noise was also identified to be a threat of Least Concern for shorebirds, and these were not considered key due to the smaller amount of time spent underwater.

Those key species were grouped into the animal hearing type, which can be impacted differently. The noise modelling modelled both immediate impacts (one strike) and cumulative (multiple hammer strikes over 24 hours), the results of the cumulative noise modelling are presented in Table 13, Table 14 and Table 15 and Figure 8 presents the noise contours from the worst case scenario (high tide - Highest Astronomical Tide (HAT))(ANV Consultants 2024).

Table 13: Cumulative impacts from impulsive noise under multiple piling pulses for PTS and TTS, end of jetty at HAT and LAT (modified from ANV Consultants 2024)

Marine fauna hearing group	Number of pulses modelled	PTS (onset)			TTS (onset)		
		Criteria – Weighted SEL24-hr dB re 1 µPa2·s	Maximum threshold distance (m)		Criteria – Weighted SEL24-hr dB re 1 µPa2·s	Maximum threshold distance (m)	
			HAT	LAT		HAT	LAT
Low frequency cetaceans (whales)	1	183	<10	<10	168	45	35
	10		25	20		180	145
	100		90	75		750	560
	500		240	185		2,080	1,500
	1,000		370	280		3,240	2,300
	2,000		560	430		5,050	3,550
High frequency cetaceans (dolphins)	1	185	-	-	170	<10	<10
	10		-	-		<10	
	100		<10	<10		35	
	500		10	10		103	
	1,000		16	15		164	
	2,000		26	25		260	
Sirenians (dugongs)	1	190	-		175	<10	
	10		-			11	
	100		<10			48	
	500		15			144	
	1,000		22			230	
	2,000		35			360	
Turtles	1	204	-		189	<10	
	10		<10			20	
	100		10			60	
	500		25			145	
	1,000		35			205	
	2,000		50			300	

Table 14: Zones of cumulative impact from impulsive noise number multiple piling pulses for mortality and recovery injury, fish, fish eggs and larvae (modified from ANV Consultants 2024)

	Number of pulses	Mortality and potential mortal injury		Recoverable injury		TTS	
		Criteria – SEL_{24hr} dB re 1µPa^2-s	Maximum threshold distance (m)	Criteria – SEL_{24hr} dB re 1µPa^2-s	Maximum threshold distance (m)	Criteria – SEL_{24hr} dB re 1µPa^2-s	Maximum threshold distance (m)
Fish - no swim bladder (particle motion detection)	1	219	-	216	-	186	<10
	10		-		-		25
	100		<10		<10		85
	500		<10		<10		210
	1,000		<10		<10		280
	2,000		<10		12		450
Fish eggs and fish larvae	1	210	-		-		-
	10		<10		-		-
	100		<10		-		-
	500		12		-		-
	1,000		16		-		-
	2,000 pulses		25		-		-

Table 15: Zones of immediate impact from a single impact piling pulses for behavioural changes for marine mammals and turtles (ANV Consultants 2024)

Marine fauna group	Criteria – SPL RMS, dB re 1 µPa	Behavioural response maximum threshold distance (m)	
		High tide	Low tide
Low frequency cetaceans (whales)	160	1,130	840
High frequency cetaceans (dolphins)		1,130	840
Sirenians (dugongs)		1,130	840
Turtles	166	550	410

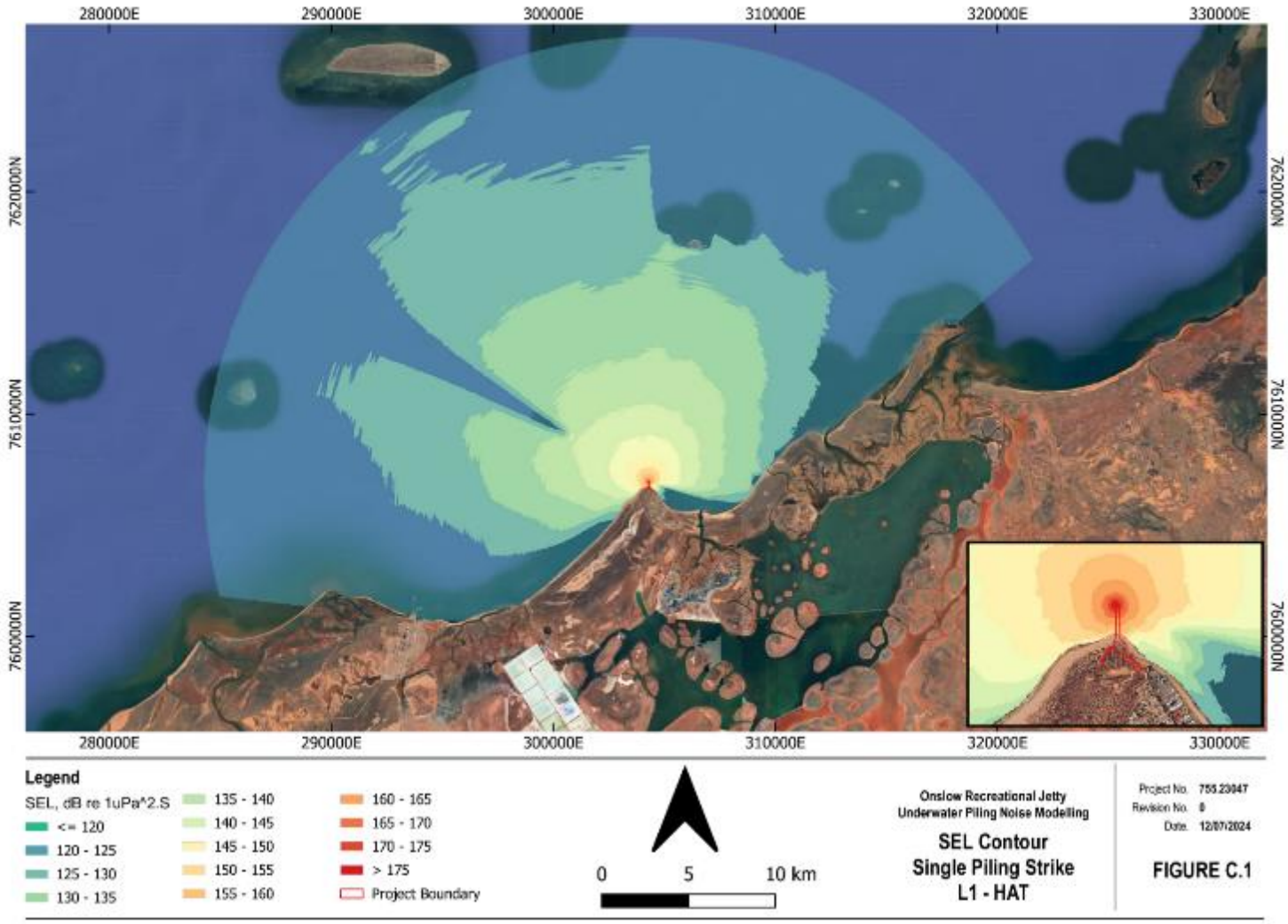

Figure 8: Noise contour figure from modelling scenario - worst case scenario – high tide at the end of the jetty (ANV 2024)

The modelling results found that low frequency cetaceans, namely humpback whales, have the greatest potential to be impacted by underwater noise generated by piling, for both immediate and cumulative impact. The results indicate that PTS threshold would be exceeded within 250 m of the piling when exposed to 500 piling pulses and within 560 m with 2,000 piling pulses, for HAT at the end of the jetty (worst-case). TTS had the largest potential impact zones with exceedance expected within 2 km of piling when whales are exposed to 500 piling pulses and if exposed to 2,000 piling pulses TTS could occur within 5 km (ANV 2024). These zones were lower for the modelling scenario at LAT (see Table 13). Humpback whales have been infrequently sighted within 5 km of the Proposal however given the species population expansion and possible extension of calving habitat (Bedjer et al. 2019) during their southern migration humpback whales may infrequently be present within 5 km of the Proposal area.

Dolphins (high frequency) and dugongs (sirenians) had much lower threshold distances for both PTS and TTS for the worst-case scenario (HAT, 2,000 pulses), with PTS <35 m and TTS <360 m. Modelling results were similar for turtles which had a max PTS distance of 50 m and 300 m for TTS. Underwater noise modelling results shows that fish (no swim bladder) and fish eggs and larvae had a maximum TTS distance of 450 m and mortality and potential mortal injury distance of <10 m and 25 m respectively (2,000 pulses). It is likely that fish species that are close (near and intermediate) distance from the pile location will experience temporary masking and behavioural response.

The noise modelling maximum distances are likely to represent a precautionary approach and appropriate management actions can be implemented including pre-start, soft-start, and stop work procedures to ensure that individuals are unlikely to be exposed to 2,000 pulses.

Underwater noise from the Proposal can be effectively mitigated as outlined in Section 9.5. The residual impacts from underwater noise from piling are considered minor with temporary disturbance of marine fauna present in the vicinity during piling, possibly resulting in temporary behavioural changes to avoid noise-affected areas. Therefore, it is expected that the jetty construction will not cause population level consequences.

9.6.2. Disturbance of marine fauna from construction activities

Turtles, seabirds and shorebirds are known to be present within the Proposal area though no nesting or roosting for any seabird or shorebird species has been identified within the Proposal area and turtles infrequently nest along the beach adjacent to the Proposal.

With the avoidance of construction activities during peak nesting (October to February) and limited use of the area by the species it is anticipated that impacts can be appropriately managed (see Section 9.5). Therefore, the likelihood of disturbance from construction activities on turtles (nesting turtles, eggs, and emerging turtles), migratory shorebirds (foraging and roosting), and seabirds (foraging) is low. The Proposal activities are unlikely to result in significant declines in the local or regional populations of marine fauna and their distribution, or reductions in the diversity of species.

9.6.3. Habitat loss, degradation and modification

Habitat degradation and modification has been identified as a threat of Concern for the flatback turtle, and a threat of Potential Concern for the dugong, Australian humpback dolphin, Indo-pacific

bottlenose dolphin, hawksbill turtle, green turtle, sea snakes, shorebirds, and seabirds (including wedge-tailed shearwaters) (DSEWPaC 2012a).

9.6.3.1. Loss of habitat

The Proposal does not require any dredging and therefore the direct loss of BCH from the pile installation will be minor and localised to the pile footprints. The BCH present within the Proposal DE does not represent important habitat for marine mammals and given the tidal ranges it is unlikely to provide important habitat for other key species.

The Proposal involves minor clearing of sandy beaches and dunes. These habitat types are known to provide nesting habitat for turtles and seabirds, and roosting habitat for migratory shorebirds and seabirds though it was found that Beadon Point including the Proposal area was not preferred habitat, with turtles nesting on offshore islands (green turtles, hawksbill turtles and flatback turtles) and on the mainland to the west of the Proposal at Ashburton River Delta (flatback turtles) (Pendoley et al. 2016; Pendoley Environmental 2022). Therefore, it is unlikely that minor loss or restricted of sandy beaches in the Proposal DE would impact turtle nesting in the region.

Seabirds and shorebirds were identified to be present within the Proposal area and the survey by WEPL (2022) indicated that that Proposal area and surrounding areas surveyed were likely to be infrequently visited, though no nesting or roosting was identified within the area for any species. Therefore, it is unlikely that this loss of habitat will result in significant impacts to migratory shorebirds and seabird species as this habitat is well represented in the area, and surveys of the terrestrial vegetation found that the area has previously been disturbed with evidence of weed invasion, vehicle tracks, previous clearing, and historical infrastructure. During a pre-referral meeting with DWER, the Australia fairy tern was highlighted as a potential species of concern, and whilst this species is a key species, it was not found within the area at the time of the survey and the species is more likely to be at Thevenard Island, offshore from the Proposal area (ALA 2024).

Therefore, loss of habitat, intertidal and subtidal, is not expected to lead to significant declines in the local or regional populations of marine fauna and their distribution, or reductions in the diversity of species.

9.6.3.2. Habitat modification

Artificial structures, including jetties, create new niches for species with the new piles offering a hard substrate for benthic communities to colonise. This provides habitat for fish species, including predatory fish species and therefore can increase the risk of predation of marine fauna, namely turtle hatchlings. This has been observed at Thevenard Island (Wilson et al. 2019). Given the lack of turtle nesting activity on the sandy beaches surrounding the Proposal and the tidal ranges, it is unlikely that the jetty structure will increase predation on turtle hatchlings.

9.6.3.3. Habitat disturbance

Disturbance of the beach and dunes are likely to occur due to vehicles and contractor movements during construction. This may have an impact on turtles and potentially turtle nests. The risk is considered low, as turtles are unlikely to nest along Beadon Point, however it is still possible. This will be mitigated by only conducting construction activities outside of peak nesting season, in addition to

mitigation measures including MFOs and others as described in Section 9.5, will ensure the residual risk is very low and therefore unlikely.

9.6.4. Vessel strike from construction vessels

The likelihood of vessel strike during construction from the Proposal is low due to the scale of the construction activities (i.e. spatial movements), the nature of piling meaning vessels will be slow-moving and generally consists of small support vessels, and the appropriate mitigation measures (Section 9.5). The Proposal activities are unlikely to result in significant declines in the local or regional populations of marine fauna and their distribution, or reductions in the diversity of species as a result of vessel strike.

9.6.5. Artificial light pollution

9.6.5.1. Light pollution during construction

Potential light sources during construction include potential vessels, support vehicles and construction equipment. Given the lack of turtle nesting (Pendoley et al. 2016), migratory shorebirds, and seabird activity (WEPL 2022) surrounding the Proposal, the size of the construction activities and the location of the Proposal within the Onslow township the risk of turtles, seabirds and migratory shorebirds being affected is low. Construction activities will also only be undertaken during day light hours, and therefore no artificial light will not be required. Significant impacts to marine turtles, seabirds and shorebirds are not expected as a result of artificial light during construction.

9.6.5.2. Light pollution during operations

During operations the Proposal will provide solar lighting along the jetty to ensure the safety of the public using the facility. Without appropriate mitigation this lighting could potentially affect marine fauna, namely turtles (nesting females and hatchlings), seabirds, and migratory shorebirds. The lighting design for the Proposal will be developed in accordance with the National Lighting Pollution Guidelines (DCCEEW 2023a) and therefore light pollution is not anticipated to significantly impact marine turtles, seabirds and shorebirds.

9.6.6. Invasive species

9.6.6.1. Introduced marine pests

The Proposal is expected to have limited construction vessels, though a piling barge is likely to be used which has a moderate risk of marine pest introduction and support vessels which are low risk for marine pest introduction (McDonald et al. 2015). The Proposal does not include dredging, which is considered the highest risk vector for IMPs. The piles could provide new substrate for pest establishment however there are no expected operational vessels or vectors for IMPs during operations and therefore it is unlikely that pests will be introduced and established. It is important to note that the white colonial sea squirt (*D. perlucidum*), a recognised IMP, is now widespread in the Pilbara and has been reported from Exmouth Boat Harbour, Port of Ashburton, Port of Onslow, Barrow Island, and Dampier (Bridgwood and McDonald 2014; DPIRD 2017). The species has only been recorded on artificial surfaces and without a vector for translocation it is unlikely to occur on the Proposals infrastructure.

Given the likelihood of the introduction of marine pest during construction from Proposal vessels is low (i.e. short construction timeframe and small DE, no dredging), it is unlikely that IMPs will become established and effect the biodiversity and/or ecological integrity of local marine fauna and ecosystems. Mitigation measures will also be undertaken to decrease this risk further, as described in Section 9.5. The risk of marine pest incursion during construction and operations is considered to be negligible.

9.6.6.2. Invasive terrestrial species

In northern WA predation of turtle eggs and seabirds from foxes and pigs is considered a significant threat. Infrastructure development may facilitate the expansion; however foxes are known to occur in Onslow and it is understood that foxes are known to predate on turtle nests on back beach in Onslow. Given the Proposal is located in the already developed Onslow Township, and the lack of risk species activity around the Proposal area, it is unlikely that the construction and operations of the recreational fishing jetty will increase the occurrence of feral predators and increase predation on marine species. Further, with the appropriate waste management and existing fox control measures in Onslow it is the risk of invasive terrestrial incursion during construction and operations is considered to be negligible.

9.6.7. Hydrocarbon spill causing marine fauna injury or fatality and/or impacts on critical habitat

The construction phase of the Proposal will include the mobilisation of a small fleet of vessels, machinery and vehicles to the area to facilitate the construction activities. Therefore, there is the potential for a hydrocarbon spill associated with the Proposal, however the risk of a hydrocarbon spill is low and therefore the threat to marine fauna is considered very low. With the implementation of the MCEMP (Appendix E) this risk will be negligible.

9.6.8. Entanglement/ingestion of marine debris

9.6.8.1. Entanglement/ingestion of marine debris during construction phase

General waste is expected with any construction activity and sources of marine debris from the Proposal activities include direct disposal into the marine environment or wind borne little from vessels or landside infrastructure. However, with all waste and debris being appropriately disposed of, stored and managed in accordance with the MCEMP (O2 Marine 2024b) the likelihood of waste and debris entering the marine environment can be prevented. Therefore, it is unlikely to result in declines in the local or regional populations of species and their distribution, or reduction in the diversity of species attributed to marine debris from construction activities.

9.6.8.2. Entanglement/ingestion of marine debris/fishing gear during operational phase

Fishing is popular in Onslow, and the Proposal will provide another location for this activity. Providing bins for waste and education around littering will encourage the minimisation of waste entering the marine environment.

Given the small scale of the Proposal and the current fishing effort by recreational fishers in Onslow, it is unlikely that the Proposal will increase human interactions with marine fauna and result in further impacts from marine debris.

9.7. Environmental outcomes

The proposed environmental outcome for marine fauna is 'no reported negative impacts on marine fauna attributable to the Proposal'.

This environmental outcome has been used to develop the management targets and monitoring and management of construction activities in the MCEMP (O2 Marine 2024b).

Consideration of the potential impacts to MNES, residual nature and magnitude, has been completed within the Marine Fauna Desktop (O2 Marine 2024d; Appendix C). With the proposed avoidance of ecological windows and other mitigation measures to be undertaken during construction and operations, it is expected that the Proposal will result in acceptable impacts to marine fauna. Overall, significant impacts to Marine Fauna are not anticipated and it is expected that the Proposal will meet the EPA Objective for Marine Fauna.

10. Social surroundings

10.1. EPA Objective

The EPA's objective for Social Surroundings is 'To protect social surroundings from significant harm'.

10.2. Policy and guidance

The following EPA guidance has been considered in evaluating the potential impacts on this factor:

- EPA (2023b) Environmental Factor Guideline: Social Surroundings.
- EPA (2023c) Technical Guidance: Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage.

10.3. Receiving environment

The town of Onslow has a population of less than 1,000 people and is located within the Shire of Ashburton. It was originally located 18 km south-west of the current site, at the mouth of the Ashburton River, and was heavily affected by flood and cyclones. It was relocated to Beadon Point as surveys indicated that the water was deeper and more suitable for vessels there (Shire of Ashburton 2024).

The Onslow town jetty is part of the Onslow Foreshore Promenade Masterplan which outlines aims to develop a beach front with modern amenities from the northwestern end at the jetty, to Beadon Creek to the east of the townsite.

10.3.1. Aboriginal Heritage

The Thalanyii, Nhuwala and Burama people have been the traditional owners of the Onslow area for thousands of years (Place Laboratory 2022). The area holds special significance to other Aboriginal peoples from the inland Pilbara whose stories, song lines and spiritual beliefs are connected to the land and place. The Thalanyii have held the native title rights of the land in and around the township and port of Onslow in 2008 (WCD2008/003).

A search of the Department of Planning, Lands and Heritage (DPLH) Aboriginal Cultural Heritage Inquiry System (Department of Planning 2024) identified that the Proposal is located within the DEW TALU Aboriginal Heritage Site 6618 (Table 16). The ONSLOW 1 Aboriginal Heritage Site is noted due to its proximity to the Proposal site and the location of proposed access points. ONSLOW 1 is located 350 m to the south southwest of the Proposal site. Both sites have no gender restrictions to this site (Table 16).

Table 16: Registered Aboriginal Heritage Sites (DPLH 2024)

ID	Name	Place Status	Type
6618	DEW TALU	Registered site	Ceremonial, Water Source
8920	ONSLOW 1	Registered site	Artefacts/Scatter; Midden/Scatter

Figure 9: Registered Aboriginal heritage sites surrounding the Proposal

10.3.1.1. Aboriginal archaeological and ethnographic heritage survey

A site survey was undertaken on 11 June 2023 of the "Onslow Ocean View Caravan Park overflow areas" which also encompasses the Proposal area as shown in Figure 10 (in addition to two other areas relevant to other Shire of Ashburton Proposals also shown in Figure 10). Thalanyji Traditional Owners participated in the survey, and no isolated artefacts or archaeological sites were identified on the day. However, there were particular concerns around this site, as coastal dunes in Onslow are a high-risk zone for cultural heritage sites, specifically shell middens and burials. These middens occur within the sand dunes with limited cultural material on the surface and are dated between 5,600 and 500 years old (Veth, Ditchfield and Hook 2014). These are highly significant as they can provide information regarding long term climate change at the end of the last ice age and Thalanyji's ancestors land use practices.

An additional ethnographic assessment was conducted of the Onslow Recreational Jetty Project Area between 25 and 28 June 2024 by Thalanyii Representatives (Darheio Gibb, Joseph Kelly and Jaiden Hayes), senior anthropologist Jaimal Sandhu and with assistance from BTAC Heritage Coordinator Richard Gordine. An on-site assessment was undertaken to focus on the Proposal area (Figure 11), followed by a discussion with two Thalanyii Elders (Anne and Shirley Hayes) with maps and media of the survey area provided to facilitate.

Based on a combination of desktop research and the on-site assessment it is believed that the registered sites identified through the Aboriginal Cultural Heritage Inquiry System do not fall within the boundaries of the Project area (Archae-aus 2024) and no new Aboriginal Cultural Heritage Aites were identified. In addition to this, a previously identified site Dew Talu (ID: 6618) does not intersect with the Proposal area, and the boundaries given in the DPLH records are likely incorrect. However, Shire of Ashburton has applied for a section 18 under the *Aboriginal Heritage Act 1972* to disturb the site, based on the recorded boundaries.

Figure 10: Aboriginal and ethnographic survey area (Archae-aus 2023)

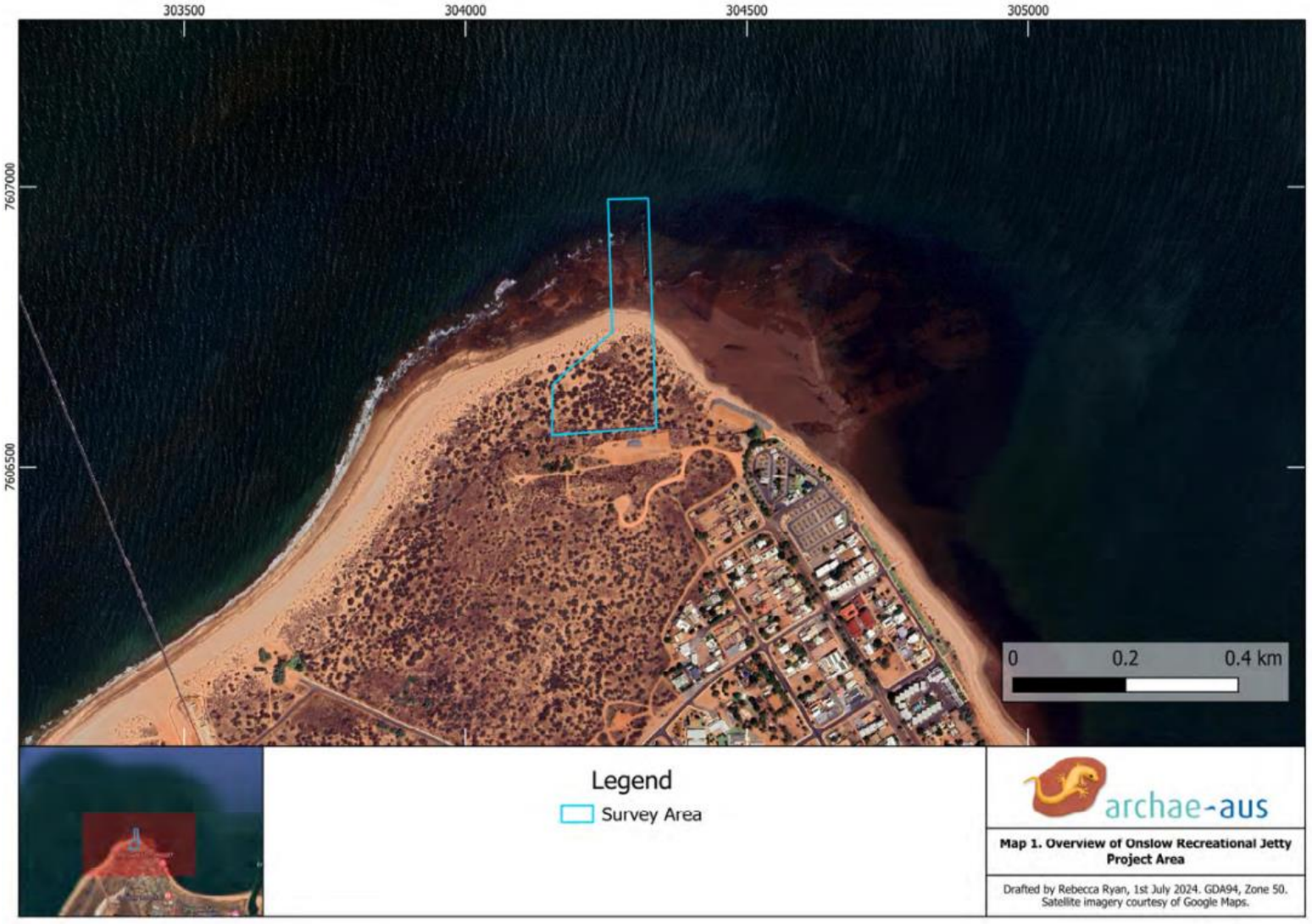

Figure 11: Additional Aboriginal ad ethnographic survey area (Archae-aus 2024)

10.3.2. National Heritage Listings

There are two State Registered Places related to the old Onslow townsite registered with the Heritage Council of Western Australia (DPLH 2024). Table 17 outlines each sites description and its distance from the Proposal site.

Table 17: Registered State Heritage Sites (DPLH 2024)

ID	Name	Location	Distance from Proposal Site
3949	Old Onslow Police Station	Corner Old Merrow St & Densil St, Onslow	12.6 km
3444	Old Onslow Townsite	Reserve 35118, Talandji	18.8 km

10.3.3. Onslow Jetty Heritage

An historical timeline of the Onslow Jetty has been previously prepared by the Shire of Ashburton (2024b). The wooden jetty approximately three-quarters of a kilometre was constructed off Beadon Point in 1925 to cater for ships importing building equipment and general merchandise and exporting wool, shell, and minerals through Onslow. It was rebuilt in 1934 after being damaged from a cyclone. Another cyclone damaged the jetty in 1961 and it fell into disrepair after an alternative landing was built in Beadon Creek in 1972. The original jetty was destroyed in an Army explosives exercise in 1982 (Shire of Ashburton 2024b).

10.3.4. Other land users

The area is currently used for recreational fishing, and there is a pedestrian path along the coast. Users identified for the upgraded Onslow Promenade (Place Laboratory 2022) include:

- Mature travellers aged 55 and over
- Residents from neighbouring areas
- Families on vacation (mainly during school holidays)
- Backpackers
- Local residents
- Semi-permanent mine workers (fly in fly out)

These users are likely to have various expectations and requirements from the facility, including cultural and historical information, places to walk safely and sit, but also continue to fish and use the beach.

10.4. Potential environmental impacts

Social surroundings may be impacted by the Proposal due to construction activities including possible land clearing and fencing off areas for construction works. These Potential impacts (direct and indirect) to social surrounds associated with the Proposal may include, but are not limited to:

- Disturbance of Aboriginal Heritage places within the landside development area during construction activities

- Restricted access to culturally significant Aboriginal Heritage places during construction phase of the Proposal
- Temporary closure of the coastal public walkway
- Restricted access for the public, including recreational fishers, to Beadon Point during landside development and jetty construction
- Construction activities increasing dust and noise pollution disrupting residents and visitors of Onslow.

As identified in Archae-aus (2023) the disturbance of sand dunes may also impact the shell middens causing permanent loss of information of historical significance.

10.5. Mitigation

In the survey report, Thalanyji Traditional Owners recommended that the coastal area along the survey be excised for important cultural reasons within the Proposal area (Archae-aus 2023). Stakeholder engagement including with Thalanyji Traditional Owners will be undertaken prior to the commencement of construction activities, and the following mitigation measures may be adopted based on recommendations:

- Having a Thalanyji Traditional Owner representative present during construction activities, particularly if digging is required to monitor the works
- The Aboriginal Cultural Heritage listed site 6618 (DEW TALU) encompasses all the landside development envelope, and the intertidal zone of the marine environment. Therefore, traditional owners should also be present through the construction of the jetty within the intertidal zone.
- Clearly communicate the Proposal and any beach closures prior to the commencement of construction to all stakeholders
- Clearly mark out closed areas required for construction activities.

Construction on land has been designed to be minimal, with no laydown areas requiring land clearing. Only one access road will be required and the existing access paths will be used as far as practicable.

10.6. Assessment and significance of residual impacts

The land clearing to be undertaken is small in comparison to the caravan park, though parts will be undertaken within the sand dunes to create access to the jetty. The DE has been assigned to minimise the area of impact, though some sand dunes and area will be impacted.

Stakeholder engagement will continue to be undertaken throughout the process, including during construction as described in the mitigation actions above.

Digging is unlikely to be required, though some land clearing will be needed with the possible removal of topsoil. The shell middens are likely to not be disturbed, as land clearing will be minimal and the path will be laid on top of soil. Soil will not be moved from the Proposal area.

Land within the Caravan Park has been approved to be cleared, which is of a similar nature. Therefore it is likely that the area for this Proposal would also be approved.

10.7. Environmental outcomes

The proposed environmental outcome for social surroundings is ‘no reported complaints from the general public associated with the Proposal’.

11. Other environmental factors or matters

Environmental factor	Justification
Coastal Processes	The EPA's objective for this factor is 'to maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected'. The proposed infrastructure is unlikely to impact coastal processes as the jetty will be on piles which will still allow water to flow underneath it. During construction, a temporary causeway may be required which may prevent water and sediment flow. However, this impact would be small in scale and temporary and would not lead to permanent changes in coastal processes. Therefore coastal processes is not considered a key environmental factor.
Flora and vegetation	The EPA's objective of the factor Flora and Vegetation is 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained'. Western Environmental Pty Ltd (WEPL) conducted a detailed flora, vegetation, and basic terrestrial fauna survey for the proposed development of the 'Onslow Hedland Plan' which included the Proposal area (WEPL 2022). The Survey Area covered an area of 7.73 ha and was located immediately to the north of the Onslow townsite and encompassed much of the terrestrial area of the Proposal site (Appendix D). The site is within the Carnarvon bioregion (CAR01) of Western Australia and the flora desktop assessment identified 20 conservation listed species occurring within 100 km of the Survey area. A pre-survey likelihood of occurrence assessment was undertaken and determined one species as having a high likelihood of occurrence, two species as having a medium likelihood of occurrence and 16 species as having a low likelihood of occurrence (WEPL 2022). Post survey, all conservation listed species were assessed as having a low likelihood of occurrence. The detailed flora and vegetation survey recorded the floristic composition and vegetation types from four quadrats, mapping notes and opportunistic observations. A total of 43 taxa were recorded from 33 genera across 17 families. No Threatened flora species pursuant to the EPBC Act and/or gazetted as Threatened Flora pursuant to the BC Act and/or Priority Flora species were recorded during the survey or expected to occur. This finding is consistent with that reported by 360 Environmental (2021) and ENV Australia (2011) in biological surveys covering lots directly adjacent to the Survey area containing similar vegetation types/habitats.

Environmental factor	Justification
	Two vegetation types were described and mapped, both being representative of existing broad scale vegetation, and soil and land system mapping for the area. None of the vegetation types were representative of Threatened or Priority Ecological Communities (PEC). Four introduced taxa were recorded during the survey with Buffel grass (*Cenchrus ciliaris*), birdwood grass (*Cenchrus setiger*) and kapok (*Aerva javanica*) cumulatively covering 25-40% of the ground stratum in most areas. Vegetation condition was degraded throughout the whole Survey area. There was also evidence of disturbance including weed invasion, vehicle tracks, previous clearing, and historical infrastructure. As no Threatened flora species pursuant to the EPBC Act and/or gazetted as Threatened Flora pursuant to the BC Act and/or Priority Flora species were recorded during the survey or expected to occur, impacts to the environmental objectives for flora and vegetation are considered unlikely. Clearing will also be within a small area of the development envelope, anticipated to be no more than 1.4 ha.. Therefore this is not considered to be a key environmental factor and the EPA's objective will be met. A works approval including clearing approval will be sought under Part V following the Part IV decision.
Terrestrial Environmental Quality	The EPA's objective for this factor is 'to maintain the quality of land and soils so that environmental values are protected'. According to the DWER contaminated sites database (DWER 2024) there are three contaminated sites within 5 km of Beadon Point, though these are more than 2.5 km away. These include: • 127 Onslow Road - asbestos-impacted fill material buried (2.6 km away) • Lot 549 On Plan 173181 – hydrocarbons (such as from diesel/oil) present in soil (2.9 km away) • Lot 561 Beadon Creek Rd - hydrocarbons (such as from diesel/oil) present in soil, sediment and groundwater surrounding the diesel pipe terminals in the wharf area. Barium is also present is soil and an isolated location on the site historically filled with drilling mud (3.9 km away). Mapping of acid sulfate soils indicates areas with a high probability of acid sulfate soils within the Shire of Ashburton occur largely along the coastal areas, both north and south of Onslow. Small pockets of high probability areas also occur in the south along waterways, as well as in localised sites in the southwest, north and east of Onslow. The Proposal site is located within an area of moderate – high risk, with terrestrial areas generally moderate risk (WA data 2024). Metals in soils were sampled as part of the AIP approximately 15 km south-west south of the Proposal site. Screening of heavy metals and metalloids in comparison to DGVs for Ecological Investigation Levels (EILs) available in the National Environmental Protection Measure

Environmental factor	Justification
	(NEPC 2013) indicated that exceedances of copper, nickel and zinc were recorded. However, it was noted that concentrations of metals are likely to represent naturally occurring concentrations. The Proposal DE is outside of any areas of known contamination and no potentially contaminating activities are proposed as part of the Proposal, except for the risk of waste or hydrocarbon spills which would be temporary and localised. These risks will be managed in accordance with the Contractors construction management plan. This Proposal is unlikely to have a significant impact on terrestrial environmental quality, and therefore it is not considered to be a key factor.
Terrestrial fauna	The EPA's objective for this factor is 'to protect terrestrial fauna so that the biological diversity and ecological integrity are maintained'. Migratory shorebirds and seabirds impact assessment for this Proposal has been conducted under the key environmental factor Marine Fauna. The PMST search undertaken for the marine fauna species also encompassed the terrestrial area of the Proposal, and the search identified the following terrestrial CSMF as having a 'known' or 'likely' occurrence within the search area: Known • Northern quoll (*Dasyurus hallucatus*) (Endangered) • Black-eared cuckoo (*Chalcites osculans*) (listed as Marine under *Chrysococcyx osculans*) Likely • Northern short-tailed mouse (*Leggadina lakedownensis*) (Priority 4 species under the BC Act) • Maryan's keeled slider (*Lerista planiventralis*) (Priority 1 species under the BC Act) • Fork-tailed swift (*Apus pacificus*) (Migratory) • Grey falcon (*Falco hypoleucos*) (Vulnerable) WEPL (2022) also conducted a basic terrestrial fauna survey during the flora and vegetation survey described above. During the survey, there were no observations or secondary evidence recorded for threatened and priority fauna within the survey area. An old nesting site was recorded for the Migratory species osprey (*Pandion cristatus*) to the south of the Proposal site. Habitat types were also mapped during this survey, and two fauna habitat types were recorded within the survey area (Acacia shrublands on stable dunes, and acaia and spinifex beach/primary dunes), both well represented within the region. These habitat types corresponded

Environmental factor	Justification
	with the vegetation types and the major soil landscape/ geology units present and had similar characteristics with sandy dunes covered by Acacia shrubs and open grasslands. It was noted that the proximity to town, presence of cats, disturbance through prior clearing and invasion by weeds had reduced the quality of the habitat across the survey area (WEPL 2022). Based on the CSMF information, survey and assessment results from WEPL (2022) only one potential key species for terrestrial fauna for the Proposal was identified, namely the Maryan's keeled slider (*Lerista planiventralis*). However, given the small amount of land disturbance during construction and the proximity to other construction works recently undertaken for the Onslow Caravan Park extensions, it is unlikely that impacts will be significant. Mitigation actions to ensure there are no impacts will be detailed in the works approval under Part V of the EP Act, and in the Contractor specific construction environmental management plan. As no significant impacts are likely, this factor was not considered to be a key factor for this Proposal.
Landforms	The EPA's objective for this factor is 'to maintain the variety and integrity of significant physical landforms so that environmental values are protected'. Distinctive physical landforms are unlikely to be impacted in such a way that their environmental values would be compromised. No significant impacts for landforms are anticipated and therefore this is not considered a key factor.
Subterranean fauna	The EPA's objective for this factor is 'to Protect subterranean fauna so that biological diversity and ecological integrity are maintained'. No impacts to Subterranean fauna are anticipated as this Proposal is not disturbing groundwater or water bodies. Therefore this is not considered to be a key environmental factor.
Inland waters	The EPA's objective for this factor is 'to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected'. No significant impacts to groundwater or surface water are anticipated.
Air quality	The EPA"s objective for this factor is 'to maintain air quality and minimise emissions so that environmental values are protected'. The construction activities associated with the Proposal may generate temporary and localised impacts including dust, however this will be minimised through the application of industry standard construction management. No air quality impacts are anticipated during operations. Therefore no significant impacts to air quality is anticipated, and not considered to be a key environmental factor.

Environmental factor	Justification
Greenhouse gas emissions	The EPA's objective for this factor is 'To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change'. The GHG emissions anticipated from construction will be significantly less than the EPA threshold of 100,000 tonnes of scope 1 emissions each year measured in carbon dioxide equivalent (CO_2e.). no greenhouse gas emissions are expected during operations as no vehicles or vessels will be accessing the jetty. Therefore this is not considered a key factor for this Proposal.
Human health	The EPA's objective for this factor is 'to protect human health from significant harm'. As many aspects of human health are related to the other environmental factors, this factor is only relevant to impacts associated with radiation. No radiation is expected from this Proposal, and therefore is not considered a key environmental factor.

12. Offsets

Due to the small scale of the Proposal, offsets are not considered appropriate or required. All impacts can be effectively managed using avoidance and minimisation and no significant impacts are anticipated to occur as a result of the Proposal.

13. Matters of National Environmental Significance

Matters of National Environmental Significance (MNES) were previously presented in Section 4.6 of this document. Most were located outside of the Proposal area, with the exception of threatened and migratory species. These species were then reviewed in the key environmental factor Marine Fauna (Section 9). Other MNES not presented in Section 4.6 were not relevant and not located near this Proposal included Activities related to nuclear energy including uranium mining, the Great Barrier Reef Marine Park and water resources in relation to coal seam gas development and large coal mining development.

13.1. Approved conservation advice and recovery plans

Some species listed under the EPBC Act have approved Conservation Advice which provides guidance on immediate recovery and threat abatement activities that can be undertaken to ensure the conservation of a newly listed species or ecological community (DCCEEW 2023b). The relevant conservation objectives and priorities for the key species are presented in Table 18 where there is species-specific conservation advice or listing advice.

Table 18: Conservation and listing advice applicable for key species

Conservation and/or listing Advice	Objectives or priorities
Listing Advice Megaptera novaeangliae Humpback Whale (TSSC 2022)	Current known threats: • Climate and Oceanographic Variability and Change • Vessel disturbance and strike • Entanglement • Noise interference • Marine debris
Approved conservation advice for the *Aipysurus apreafrontalis* (short-nosed sea snake) (DSEWPaC 2011a)	Regional Priority Actions: Priority Actions: • Habitat loss, disturbance and modification • Conservation Information • Enable Recovery of Additional Populations
Listing Advice for *Sphyrna lewini* (scalloped hammerhead) (TSSC 2024)	Threats: • Fisheries (WA, NSW, Commonwealth and recreational) • Habitat degradation • Climate change.

Conservation and/or listing Advice	Objectives or priorities
Australian Fairy Tern (*Sternula nereis nereis*) Listing advice (DSEWPaC 2011b) Commonwealth Listing Advice on *Sternula nereis nereis* (Fairy Tern) (TSSC 2011)	Conservation and management actions include: • Habitat loss, disturbance and modification • Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary • Identify populations of high conservation priority • Manage any changes to hydrology that may result in changes to tide levels, increase salinity or pollution • Introduce recreational codes of conduct and license commercial tourism operations utilising the subspecies' habitat Animal predation or competition • Develop and implement a management plan for the control or eradication of foxes, dogs, cats and black rats where the species is found • Establish programs to discourage gulls (such as silver gulls) competing with fairy terns.
Conservation Advice for *Limosa lapponica menzbieri* (Yakutian bar-tailed Godwit) (DCCEEW 2024e) Conservation Advice for *Tringa nebularia* (common greenshank) (DCCEEW 2024f) Conservation Advice for *Charadrius leschenaultia* (greater sand plover) (DCCEEW 2023c)	Primary conservation objective: • Minimise further loss of habitat critical to the survival of ['species name'] throughout Australia (including habitat predicted to become habitat critical in the future because of climate change). • Prevent further declines in ['species name'] populations within the Australian jurisdiction by working with relevant Range States to address threats in the East Asian Australasian Flyway. Conservation and management priorities : • Habitat loss, disturbance and modification impacts • Climate change and severe weather impacts • Invasive species impacts • Human disturbance • Hunting

13.2. Recovery plans

Recovery Plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities (DAWE 2021). The relevant recovery plans for this Proposal and their objectives or priorities are presented in Table 19.

Table 19: Available recovery plan, objectives and priorities for the key marine fauna species

Species and recovery **plan**	Objectives or **priorities**
Marine Turtles: green turtle, flatback turtle and hawksbill turtle Recovery Plan for Marine Turtles in Australia (DoEE 2017)	• The marine turtle recovery plan sets out the research and management actions necessary to stop the decline of, and support the recovery of turtle species within Australia, including the green turtle, flatback turtle and hawksbill turtle which are turtle species that are likely to occur within the Proposed action area. The effectiveness of this plan will be measured, and progress towards long-term objectives assessed, on the basis of how well the following targets for interim recovery objectives are met: • Current levels of legal and management protection for marine turtles are maintained or improved both domestically and throughout the migratory range of Australia's marine turtle; • The management of marine turtles is supported; • Anthropogenic threats are demonstrably minimised; and • Trends at index beaches, and population demographics at important foraging grounds are described.
Australian fairy tern National Recovery Plan for the Australian Fairy Tern (DAWE 2020)	Recovery plan objective By 2030, sustain a positive population trend (compared to 2020 baseline counts) in the number of mature individuals of the Australian fairy tern in both the eastern and western populations. This will be achieved by implementing the actions set out in this Recovery Plan that minimise threats while protecting the species' habitat throughout its range, adequately monitoring the species, generating new knowledge to guide recovery and increasing public awareness. Strategies to achieve objective: • Manage and protect known Australian Fairy Tern breeding populations at the landscape scale. • Develop and apply techniques to measure changes in population trend(s) to measure the efficacy of recovery actions. • Reduce, or eliminate threats at breeding, non-breeding and foraging sites. • Undertake research and monitoring to improve understanding of breeding, non-breeding and foraging attributes in order to better target management actions and habitat restoration. • Engage community stakeholders in Australian Fairy Tern conservation. • Coordinate, review and report on recovery progress. Priority 1: Priority 2: Priority 3: Taking prompt action is necessary to mitigate the key threats to the Australian Fairy Tern and also provide valuable information to help identify long-term population trends. Action would provide a more informed basis for the long-term management and recovery of the Australian Fairy Tern. Action is desirable, but not critical to the recovery of Australian Fairy Tern or assessment of trends in that recovery.

13.3. Threat abatement plans

Threat abatement plans provide for the research, management, and any other actions necessary to reduce the impact of listed key threatening process on native species and ecological communities (DAWE 2021). These documents outline conservation objectives, critical habitat, important populations, key threats and priority management actions and are relevant to the assessment process. The Minister must consider the content of approved conservation advice and must not act inconsistently with a recovery plan when considering whether to approve a Proposed Action.

The threat abatement plans which relate to the key species identified for this Proposal were presented in Section 9.2.

14. Holistic impact assessment

The relationship between marine environmental factors has been considered to determine whether the combined effect on multiple factors may cause a significant impact and require management. The Shire of Ashburton recognises the high degree of connectivity and interrelatedness between BCH, MEQ and Marine Fauna. Understanding the environmental processes and their interactions is critical to assessing the significance of potential impacts from the Proposal on the marine environment surrounding the Proposal and its associated habitats and flora and fauna communities.

Though the impacts to BCH are considered to be low, the maintenance of MEQ is recognised as critical to ensure BCH is protected. Importantly, apart from small, localised and temporary impacts during construction, no long-term impacts to MEQ area expected from this Proposal. MEQ and BCH also support habitats for Marine Fauna and given that the majority of the BCH found in the development envelopment of the Proposal is sand and rocky reef, significant impacts to BCH that is critical to support conservation significant marine fauna are also unlikely.

Underwater noise, which is a key potential impact identified from the proposed piling, has the potential to impact Marine Fauna and in turn impact Social Surroundings. To address this a detailed modelling and impact assessment of the likely effects of piling and other construction generated underwater noise to sensitive receptors was undertaken. Following avoidance and mitigation strategies being implemented, it is predicted that temporary increases in noise levels can be managed without significant impact to Marine Fauna and Social Surroundings.

The Proposal avoids and minimises impact to high-value and sensitive environmental receptors primarily through developing facilities in an area that has previously been subject to disturbance. Therefore the combined effects on the environment as a whole are no greater than the effects on individual factors (BCH, MEQ, Marine Fauna and Social Surroundings). Furthermore, any potential impacts to these factors will be effectively mitigated through the appropriate management of construction activities which are detailed in Appendix E.

15. Cumulative environmental impact assessment

As described above, impacts to the key environmental factors BCH, MEQ, Marine Fauna and Social Surroundings from the Proposal are not predicated to be significant. The Proposal has also been located in an area of seabed with low value BCH (predominantly rocky reef) and the area has been disturbed previously as an historical jetty site. The jetty construction method also minimises seabed disturbance and potential impacts from the generation of turbidity.

The Proposal is located within the Shire of Onslow, which has experienced an increase in visitation including workers for the nearby Mineral Resources project, and tourism, leading to an increase in fishing and the need for more facilities within the town.

As vessels will not be accessing the jetty during operations, this Proposal will not increase vessel movements in the area and human disturbance will be limited. Waste from fishing activities may increase in the area, however with education and the provision of bins this can be minimised. There are no other Projects within the vicinity which would cause cumulative impacts to the key environmental factors. Therefore it is considered that the incremental and cumulative risk to these factors from this Proposal will be acceptable.

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Appendix A. Benthic communities and habitat fieldwork and data analysis report

Appendix B. Sediment sampling and analysis report

Appendix C. Marine Fauna desktop assessment report

Appendix D. Onslow Fauna, Flora and Vegetation Survey (WEPL 2022)

Appendix E. Marine Construction Environmental Management Plan