ENVIRONMENTAL SUPPORTING DOCUMENT

South Thomson Barge Landing Development, Wadjemup / Rottnest Island

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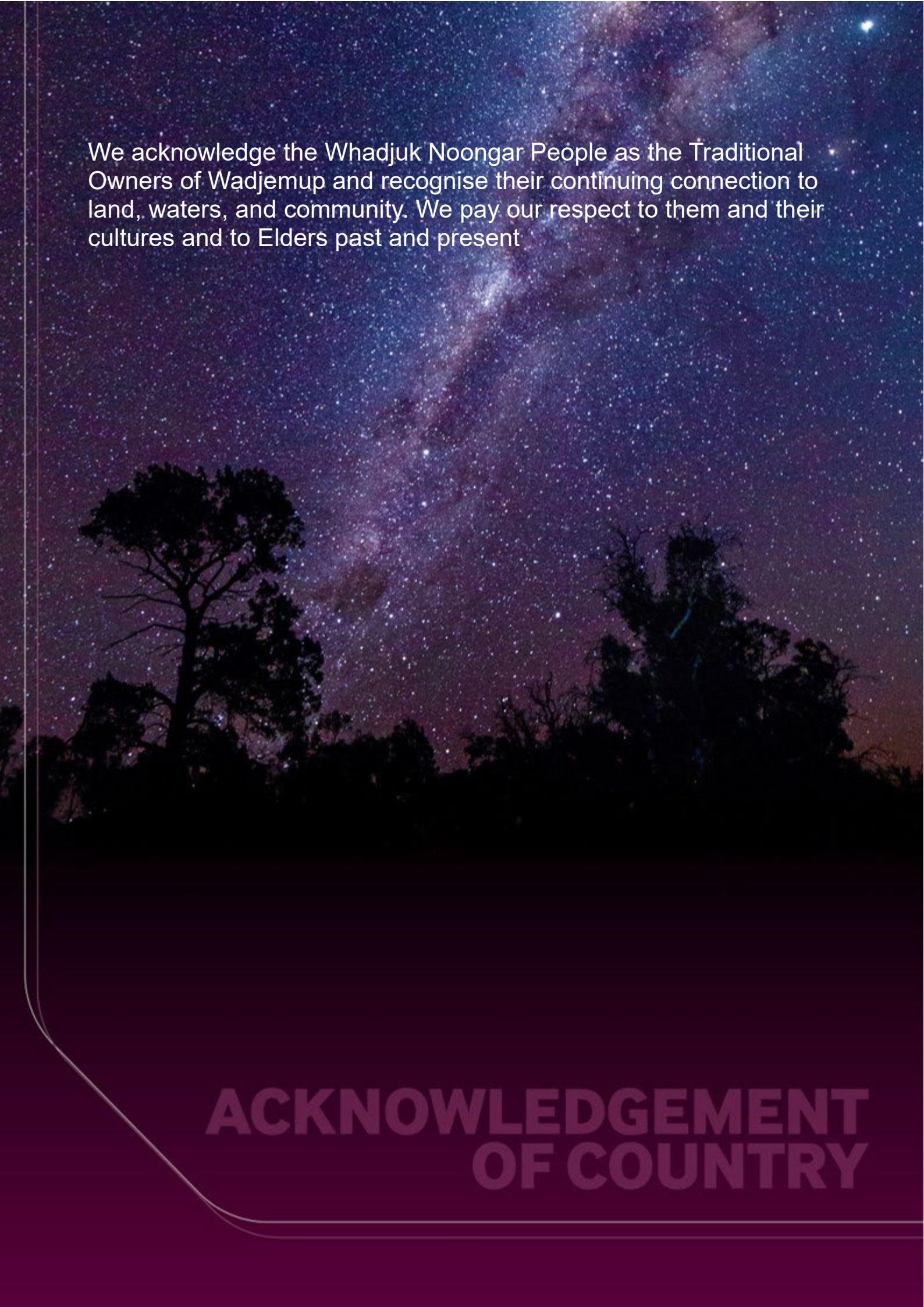


We acknowledge the Whadjuk Noongar People as the Traditional Owners of Wadjemup and recognise their continuing connection to land, waters, and community. We pay our respect to them and their cultures and to Elders past and present

ACKNOWLEDGEMENT OF COUNTRY

EXECUTIVE SUMMARY

Introduction

Ferry berthing and barge operations currently occur at the Main Jetty on Wadjemup / Rottnest Island. Rottnest Island Authority (RIA) is proposing to relocate the existing barge operations from the Main Jetty at central Thomson Bay to the Army Groyne in South Thomson Bay. This will separate barge operations from the public passenger transfer activities and ease congestion at the ferry terminal at the Main Jetty.

Figure 1 provides a regional overview of the location of the proposed South Thomson Barge Landing development and the existing barge operations at the ferry terminal at central Thomson Bay.

Figure 1: Regional overview

Purpose and scope of this document

The purpose of this Environmental Supporting Document is to describe and assess the significance of the environmental impacts to the environmental values associated with the implementation of the proposal. This report provides information on the proposal, local and regional setting, key stakeholders, potential environmental impacts, cumulative impacts and proposed mitigation measures associated with the construction and operation of the proposal.

This document has been prepared to provide a detailed description of the proposal to inform an environmental impact assessment and support both the state and federal environmental approvals as outlined in Table 1.

Table 1: Environmental assessment process summary

Jurisdiction	Environmental approval	Relevant legislation	Key sections of this report	Status
State	Referral of the proposal to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act) to describe and assess the potential impacts to the EPA's environmental factors.	Refer to Section 3.2 of this document.	The environmental impact assessment process under state legislation is outlined in Sections 7 to 13 of this document.	-
Federal	Referral of the proposal to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to address potential impacts to matters of national environmental significance (MNES).	Refer to Section 3.4.2 of this document.	The assessment of potential impacts to MNES is outlined in Section 14.2 of this document.	Proposed action is not a Controlled Action (16 January 2025)

Overview of the South Thomson Barge Landing development

The proposal comprises an onshore component and offshore component (an area of reclamation and an extension of the existing Army Groyne to form the proposed wharf) as summarised below:

- **Indicative disturbance footprint (Figure 2):** The indicative disturbance footprint encompasses the onshore and offshore physical infrastructure associated with proposal and dredge areas:
  - The onshore component comprises approximately 1 hectare (ha).
  - The offshore component comprises a wharf area (extension of the existing Army Groyne) (1.13 ha) and a dredge area (1.02 ha), resulting in a combined indicative disturbance footprint of up to 3.15 ha.
- **Development envelope (Figure 2)**: Comprises 4.83 ha and encompasses the indicative disturbance footprint (dredge area and wharf area), a buffer area, a temporary construction vessel mooring area and the dredge Zone of High Impact.

In addition to the development envelope, the environmental impact assessment presented in this report has included the predicted zones of impact from the proposed dredging activities. A Dredge Plume Modelling Assessment was undertaken by Baird (2025b) and modelled the zones of impact, these are summarised in Table 2 and shown in Figure 3.

As shown in Figure 3, the development envelope encompasses the Zone of High Impact.

Table 2: Predicted zones of impact (Baird, 2025b)

Zone of impact	Definition
Zone of High Impact (ZoHI)	The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.
Zone of Moderate Impact (ZoMI)	The area within which predicted impacts on benthic communities or habitats are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the ZoHI.
Zone of Influence (ZoI)	The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI.

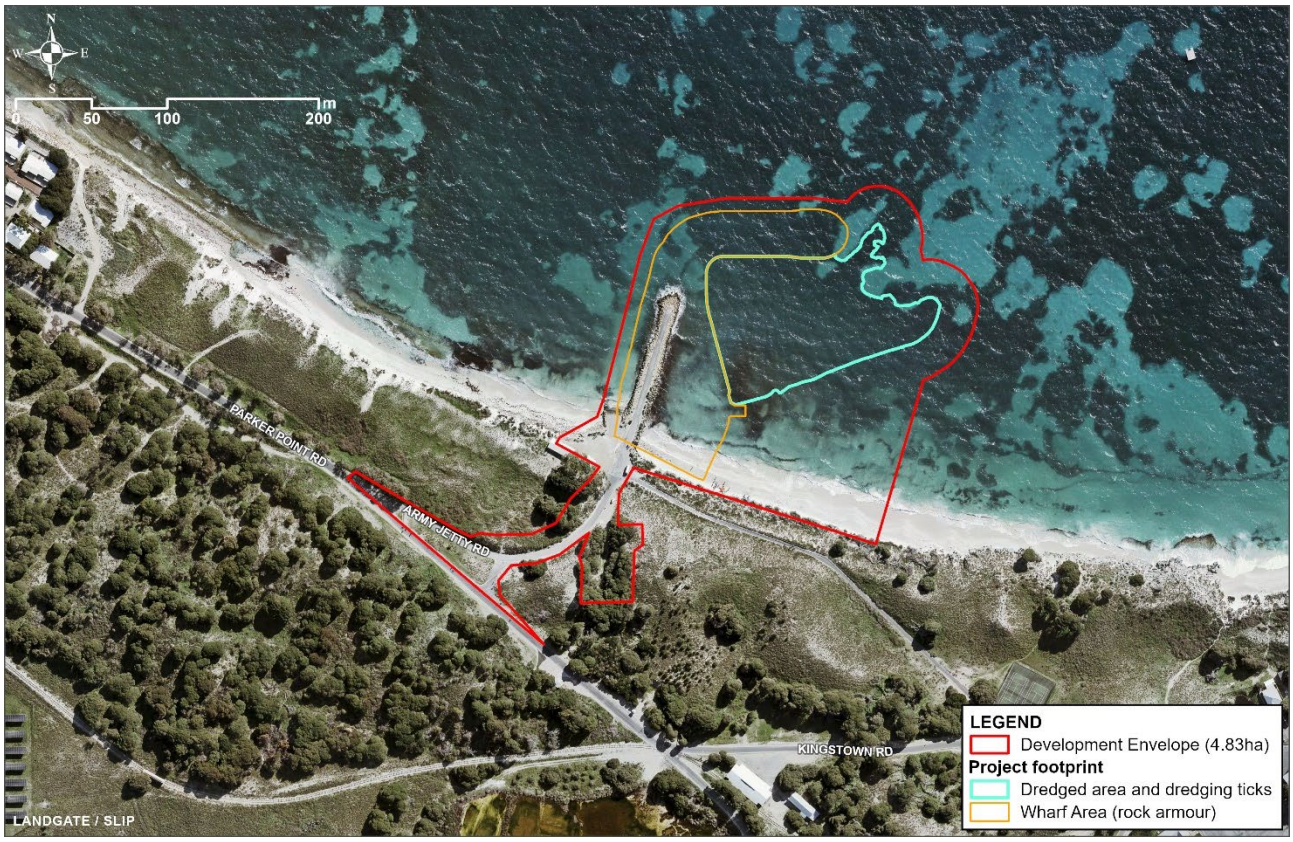


Figure 2: Development envelope

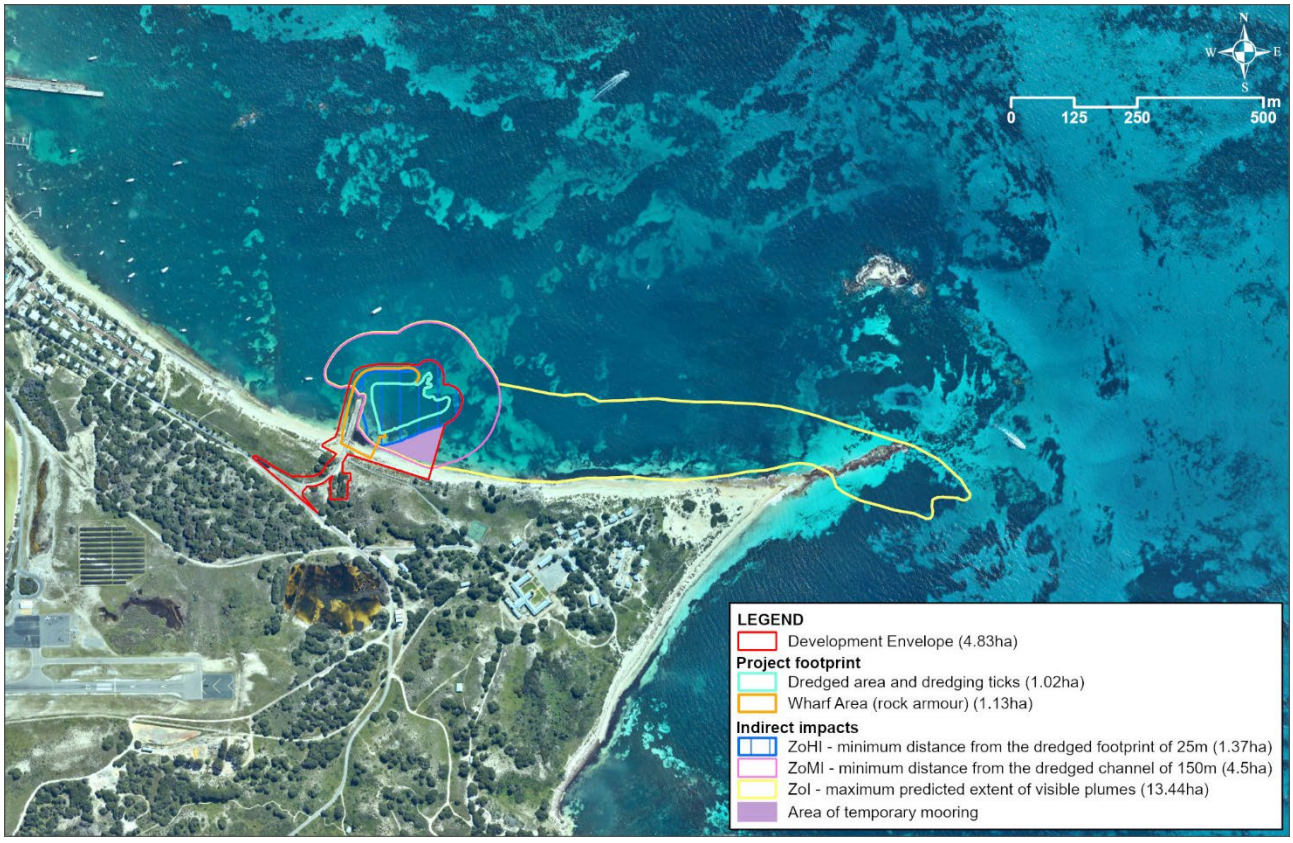


Figure 3: Development envelope and predicted zones of impact

A summary of the proposal is provided in Table 3 and a description and identification of the elements for the proposal is provided in Table 4.

Table 3: Summary of the proposal

Proposal title	South Thomson Development Barge Landing Development
Proponent name	Rottnest Island Authority
Short description	Rottnest Island Authority is proposing to relocate the island's existing barging operations away from the Main Jetty to the existing Army Groyne in South Thomson Bay. This will help reduce congestion and improve the arrival experience to the island. To support the relocation of the barge operations, Rottnest Island Authority is proposing to extend and redevelop the existing Army Groyne.

Table 4: Description and identification of proposal elements

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 10 Encompasses the indicative disturbance footprint (wharf and dredge area), a buffer area, an area proposed for the mooring of vessels and the dredge Zone of High Impact (ZoHI)).	4.83 ha
Indicative disturbance footprint	Figure 10 The indicative disturbance footprint encompasses the onshore and offshore physical infrastructure associated with proposal and dredge areas.	Total area: 3.15 ha Terrestrial disturbance footprint: 1 ha Wharf and laydown area (marine footprint): 1.13 ha Dredge area (marine footprint): 1.02 ha
Construction elements		
Dredging	Construction methodologies are provided as Appendix A. Dredging and piling are likely to be undertaken in the winter months of 2026. Dredge plume modelling by Baird (2025b) estimates that dredging may take up to 7.5 weeks to complete. The dredging methodology is summarised below: • Dredging will be undertaken with the use of a Backhoe Dredge (BHD). • The BHD is positioned with a support tug and then using its spud piles and excavator arm it manoeuvres into the required dredging location. • The loosening or cutting process breaks the in-situ materials' cohesion, allowing these materials to be removed. The process will be carried out mechanically using the cutting edge of a bucket on a BHD. Once loosened or dislodged, these materials will be raised to the water's surface mechanically via raising the bucket or grab of a BHD. • Excavated material is placed onto a flat-top barge moored alongside the BHD. When the barge is filled to its safe working capacity, it will drive to the RORO facility to be unloaded. • A silt curtain around BHD will be installed to mitigate the potential environmental impact from the dredge plume. • The dredged material will be reused as fill material in the laydown/hardstand and reclamation area.	The proposed dredge area is shown in Figure 10 and comprises 1.02 ha. Dredging will be undertaken to a declared depth of – 3.0 m Chart Datum, which will include a turning basin with a nominal diameter of 80 m. An estimated 14,000 m^3 of sand and 2,017 m^3 of rock will be dredged.
Reclamation	Construction methodologies are provided as Appendix A. The reclamation methodology depicted in Figure 11 is summarised below: • Existing armour from the eastern side of the Army Groyne will be removed and used for construction of bunding. Bunding will be constructed along the eastern and northern sides of the reclamation zone to allow dredge spoil to settle and remain in place. This bunding will prevent dredge spoil from being washed away into the marine environment. Figure 11 provides an indication of the bund wall location. • The bunding will be constructed using core materials, followed by a geotextile filter layer and an armour layer. Figure 12 provides a conceptual cross-section of the bunding, reclamation fill and then adjacent dredge zone. • As reclamation progresses, the bunding on the marine side of the reclamation zone will need to be progressively moved to the north to ensure that each successive round of dredge spoil placed will remain in place. • Using the dredged spoil, the contractor will establish a tip head to place the dredged material into the water in the south-west corner of the reclamation area. Dredge spoil will be placed and spread in a north and east direction. • Material will be tipped from the Articulated Dump Truck and pushed out over the tip head using a wheel loader or similar. • Material will be compacted using a static pad foot roller. • Reclamation will continue until all dredge spoil has been placed. AECOM (2020) and PAEMAC (2024) estimated that the dredge spoil will be sufficient to complete the laydown area. There is not expected to be a requirement to import fill to complete the laydown area.	The proposed reclamation area is shown in Figure 10
Construction of the wharf	Construction methodologies are provided as Appendix A. On completion of the reclamation works summarised above, the wharf will be constructed through extending the existing Army Groyne with rock armour as outlined below: • Remove excess rock and materials and reshape the existing Army Groyne. • Import all rock and core materials from the mainland using a conventional barge converted for handling rock. • Place core materials along exposed batter. • Place filter layer (geotextile). • Place class 2 rock armour along exposed batter and class 1 rock armour along the northern breakwater. The proposed rock armour classes are shown in Figure 13. • Place a layer of crushed rock basecourse and asphalt along the Army Groyne extension to match that placed in the reclamation area.	The proposed wharf area is shown in Figure 10
Piling	• The barge landing ramp works will include Installation of mooring piles to a maximum depth of 10 m using a vibro hammer. • Construction of the ferry berth will require installation of piles using a vibro hammer rig operated from a barge located adjacent. The dimensions and number of piles is estimated at 16 × 610 mm that will be installed to a depth of 15 m. If the contractor does not install piles concurrently with construction of the breakwater, then 1200 mm sleeves will need to be installed in the rock armour so piles can be driven through the sleeves. • Construction of the small craft landing facility will include installation of piles using a vibro hammer rig operated from a barge located adjacent. The dimensions and number of piles is estimated at 6 × 500 mm that will be installed to a depth of 10 m. If the contractor does not install piles concurrently with construction of the breakwater, then 1200 mm sleeves will need to be installed in the rock armour so piles can be driven through the sleeves. As discussed in Table 14, all piling proposed will be undertaken using a vibro hammer. However, a contingency of using a hammer pile has been adopted should the vibro hammer meet refusal. Both the proposed piling method (vibro hammer) and contingency method (hammer piling) have been included in the impact assessment.	Piling locations will be determined during detailed engineering design
Other marine infrastructure and services	Hardstand and a shed structure will be constructed within the onshore component of the development envelope. Services will be installed conventionally using a combination of on island and imported small plant. Services consist of water, fire service, power, CCTV and fuel provisions.	All works will occur within the development envelope shown in Figure 10.
Operational elements		
Vessel movements	The proposed facility shall allow barge berthing, unloading and loading and departure for all conditions permitting safe transit across to Wadjemup / Rottnest Island. Typically barge and ferry operations are suspended when wind speed (ten-minute average) exceeds 40 kn and/or Hs >4 m for waters inshore of Wadjemup / Rottnest Island. The existing barge schedule, as per Pelagic Marine Services operations, is provided below. There may be exemptions to these times to accommodate for special deliveries.	N/A

Current barge activity	Time
Gates open (20 Rous Head Road, North Fremantle)	5:30 am
Same day perishable deliveries	6:15 am
Scheduled vessel departure	6:45 am
Scheduled arrival – Thomson Bay	8:30 am
Last time for arrival of vehicles and returning goods at the Thomson Bay wharf	10:30 am
Departure (Thomson Bay, depending on volumes, returning freight)	12:00 am to 1.00 pm

Proposal element	Location / description		Maximum extent, capacity or range
	Gates close (16 Mews Road, Fremantle)	4:00 pm	
Ongoing maintenance	There may be requirements for maintenance dredging during operations. An estimate of the average sediment volume above the mean sea level (that which can be easily managed by land-based dredging methods) that is moving to the area between the transects on the east side of the groyne from winter to the summer peak is 800m^3. Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.		This will be undertaken as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.
Other elements that affect extent of effects on the environment			
Proposal time	Maximum project life		Design life shall be 50 years in accordance with AS4997–2005 Normal commercial structure.
	Construction phase		Construction is proposed to be undertaken between 2026 and 2027.
	Operations phase		50 years.

Summary of environmental factors and proposed mitigation and management outcomes

This supporting document has been prepared to address the following EPA key environmental factors that are relevant to the proposal:

- Benthic communities and habitats (Table 5)
- Coastal processes (Table 6)
- Marine environmental quality (Table 7)
- Marine fauna (Table 8)
- Flora and vegetation (Table 9)
- Terrestrial fauna (Table 10)
- Social surroundings (Table 11).

Assessment of potential impacts to the environmental factors was undertaken based on the environmental investigations listed in Tables 5 to 11.

Appropriate management and mitigation measures have been developed to address potential impacts and ensure that the EPA's identified environmental objectives for each relevant environmental factor can be achieved. A range of measures will be implemented to provide certainty that the identified environmental objectives will be achieved. These measures and outcomes are summarised in Tables 5 to 11.

The assessment has concluded that the proposal is expected to be able to meet EPA's objectives for all environmental factors, subject to the implementation of the management and mitigations measures outlined in the following management plans:

- Dredging Environmental Monitoring and Management Plan (02 Environment, 2025) (Appendix O)
- Construction Environmental Management Plan (Emerge, 2025a) (Appendix P)
- Operational Environmental Management Plan (Emerge, 2025b) (Appendix Q)
- South Thomson Bay Barge Development Coastal Hazard Risk Management and Adaptation Plan (Baird, 2025c) (Appendix W).

Table 5: Summary of the potential impacts, proposed mitigation and outcomes – benthic communities and habitats

Benthic communities and habitats		
EPA environmental objective	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.	
Relevant policy and guidance	• Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016f) • Technical Guidance: Protection of Benthic Communities and Habitats (EPA, 2016h) • Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA, 2021a) and National Assessment Guidelines for Dredging (Australian Government, 2009).	
Supporting technical investigations and reports	• South Thomson Barge Landing Development; Marine fauna and benthic habitat assessment (RPS, 2024a) (Appendix B) • South Thomson Barge Landing; Benthic habitat assessment: Plume Extension Survey Area (RPS, 2023b) (Appendix C).	
Potential environmental impacts	**Direct impacts**	**Loss of benthic habitats** • Direct (permanent) impacts to 1.98 ha of mixed seagrass and 0.87 ha of sand / sand with wrack within the development envelope. The loss of 1.98 ha of mixed seagrass represents 0.5% of seagrass within the LAU. • Direct (recoverable) impacts to 0.08 ha of mixed seagrass and 0.39 ha of sand / sand with wrack within the development envelope from the mooring of construction vessels. The mooring of construction vessels is proposed within the portion of ZoMI which occurs within the development envelope. Mooring of construction vessels is unlikely to directly impact all of the 0.08 ha of seagrass within this area. However, for the purposes of this impact assessment, a conservative approach has been adopted and the entirety of the area has been included as a direct (temporary) impact. Research indicates that recovery from mechanical disturbances (such as the proposed temporary mooring) to seagrass can take between 1 to 25 months (Neus Sanmartí, 2021). However, as these direct impacts are located within the modelled ZoMI, recovery of impacts to benthic communities and habitats within this area is anticipated to take up to 5 years.
	Indirect impacts	**Reduced environmental quality** • Temporary decrease in light availability resulting from increased turbidity in the water column within the ZoI and ZoMI, leading to reduced primary productivity and potential increased mortality rates of primary producers under conditions of prolonged or acute exposure • Increased sedimentation rates, or burial, resulting in stress or increased mortality rates (under extreme conditions) • Accidental fuel spills resulting in reduced water quality and impacts on benthic communities and habitats. **Loss of benthic habitats** • Recoverable loss of 3.71 ha of benthic habitats and communities within the ZoMI (the area within which predicted impacts on benthic organisms are recoverable within a period of five years following completion of the dredging activities): – Temporary loss of 2.62 ha mixed seagrass – Temporary loss of 1.09 ha sand with wrack. **Introduction of invasive marine species (IMS)** • Alteration of the natural benthic communities in the area caused by the introduction of IMS. **Impacts from marine infrastructure** • Altered water flows and sediment transport caused by the presence of new marine infrastructure.
Mitigation	**Avoid**	• Site selection includes an already disturbed area of 0.19 ha of disturbed seabed within the existing Army Groyne footprint. As benthic communities and habitats are widespread within South Thomson Bay, total avoidance of direct impacts is not possible. • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3.
	Minimise	**Reduced environmental quality and loss of benthic communities and habitats** • The AECOM and PAEMAC value engineering works helped to not only reduce dredging requirements, but also reduce the footprint to the minimum possible to achieve the objectives of constructing a new barge landing. • Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the Construction Environmental Management Plan (CEMP) (Emerge, 2025a) (Appendix P) and Dredging Environmental Monitoring and Management Plan (DEMMP) (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area impacted by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 15. – Implementation of the CEMP and DEMMP will ensure that permanent loss of benthic communities and habitats resulting from construction of the proposal does not exceed 2.85 ha. – The potential for indirect water quality impacts to adjacent areas will be mitigated through implementation of the Marine Water Quality Monitoring Program provided in the DEMMP. This program is discussed in further detail in Section 9.6 of this report. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential indirect impacts to benthic communities and habitats from impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP – Implementation of the tiered management framework provided in the DEMMP – Implement the Benthic Communities and Habitat Monitoring Program provided in the DEMMP, including: ○ Baseline surveys within one month prior to commencement of dredging to establish baseline conditions ○ Reactive surveys during dredging (as required). ○ If a reactive survey was required during the dredging activities, then post-dredging surveys will also be undertaken (i.e. it will not be required if the water quality triggers were not exceeded). – Use of silt curtains which will minimise the potential impacts associated with increased suspended sediments – The placement of geofabric (such as Texcel 1200R) textile weave along the bund wall will ensure that the placement of dredge spoil during reclamation works will not impact or increase the dredge plume zones. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities. • The Operational Environmental Management Plan (OEMP) (Emerge, 2025b) (Appendix Q) outlines the mitigations and management measures to minimise impacts to marine environmental quality during operation. **Loss of benthic communities and habitats** • Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area of benthic communities and habitats permanently impacted by the proposal is limited to the development envelope. These measures include: – Employing high-resolution positioning system to control dredge operations to ensure that they do not occur outside the proposed dredging area – Implementing the management measures to minimise impacts to marine environmental quality as outlined in Section 9.6 of this report. **Introduction of invasive marine species** • Implementation of the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and OEMP (Appendix Q) will minimise the risk of introduction of IMS. • The proposal will be primarily used for barge operations to transport bulk cargo to and from Wadjemup / Rottnest Island. As such, the likelihood of vessels visiting the facility from international or interstate waters is low. However, any vessels from interstate or international waters will comply with commonwealth biosecurity requirements and complete the WA Department of Primary Industries and Regional Development 'Vessel Check' risk assessment (https://vesselcheck.fish.wa.gov.au). The risk assessment must indicate that the vessel poses a low risk of IMS • All vessels will have a ballast water management plan and ballast water exchanges will be in accordance with IMO requirements and the Commonwealth *Biosecurity Act 2015*. **Impacts from marine infrastructure** • Baird (2025b) identified that, due to the presence of existing infrastructure within the project footprint (Army Jetty), changes to coastal processes as a result of the proposal would be minimal. Monitoring of shoreline accretion and seagrass accumulation on the eastern side of the wharf will

Benthic communities and habitats		
		be undertaken as outlined in the OEMP (Appendix Q) and Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) (Baird 2025c) (Appendix W). As outlined in the CHRMAP (Baird 2025c), a dedicated monitoring program will be implemented, particularly on the shoreline east of the development, to support the management of wrack and sediment. It is proposed this monitoring starts pre construction and be continued through the construction phase and into the operational phase. • A five-metre buffer is notionally considered a reasonable estimate of the area surrounding marine infrastructure that may be subject to events causing additional habitat loss, including localised erosion, slumping of dredged area walls and backwash (the halo effect). The development envelope encompasses an area around the marine infrastructure ranging from 7 m to 125 m. Consequently, the development envelope encompasses the area that may be impacted by the halo effect and impacts outside the development envelope as a result of the halo effect are not anticipated.
	Rehabilitate	• Construction effects will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities. It is predicted that the temporary impacts within the ZoMI (including the area temporarily impacted by mooring of construction vessels) are recoverable within a period of five years following completion of the dredging activities (Baird, 2025b). • The 'halo effect' from the proposed marine infrastructure is included in the calculated direct impacts (within the development envelope). Areas of benthic communities and habitats which will be directly impacted are not proposed to be rehabilitated.
	Offset	Benthic communities and habitat offsets are not considered applicable to the proposal.
Residual impacts	• Permanent loss of mixed seagrass of up to 1.98 ha (or 0.5% of mixed seagrass within the LAU) • Permanent loss of sand / sand with wrack of up to 0.87 ha. It should be noted, that post-dredging activities, sand / sand with wrack is likely to accumulate and therefore this impact is unlikely to be permanent. • Temporary loss of mixed seagrass of up to 0.08 ha (or 0.02% of mixed seagrass within the LAU) and up to 0.39 ha of sand / sand with wrack within the development envelope due to direct impacts from mooring of construction vessels. It is anticipated that impacts to these benthic communities and habitats will be recoverable within a period of up to five years. • Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2025b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities.	
Environmental outcomes	**Environmental outcomes for construction of the proposal** • Irreversible impacts to benthic communities and habitats are limited to the wharf structure and ZoHI. • No observable impacts to BCH outside of the ZoMI. **Environmental outcomes for operation of the proposal** • No irreversible impacts to benthic communities and habitats outside of the development envelope during operational activities associated with the proposal, such as maintenance dredging activities (excludes other RIA activities associated with other approvals e.g. mooring installation).	

Table 6: Summary of the potential impacts, proposed mitigation and outcomes – coastal processes

Coastal processes		
EPA environmental objective	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	
Relevant policy and guidance	• Environmental Factor Guideline: Coastal Processes (EPA, 2016i) • SPP No. 2.6: State Coastal Planning Policy (Western Australian Planning Commission, 2013a) and State Coastal Planning Policy Guidelines (Western Australian Planning Commission, 2013b) • Coastal Hazard Risk Management and Adaptation Planning Guidelines (Department of Planning and Western Australian Planning Commission, 2014) • Sea Level Change in Western Australia, Application to Coastal Planning (Department of Transport, 2010).	
Supporting technical investigations and reports	• South Thomson Barge Landing Development; Coastal processes assessment (Baird, 2025a) (Appendix D) • RIA Peer Review of Dredge Plume Modelling and Coastal Processes Reports (RPS, 2024c) (Appendix E).	
Potential environmental impacts	**Direct impacts**	**Interruption to longshore currents, resulting in changes to wrack and sediment accumulation** • Engineered marine structures have the potential to interrupt longshore currents, trapping sediments and wrack. • The Coastal Processes Assessment undertaken by Baird (2024) identified that longshore currents within South Thomson Bay are currently interrupted by the existing Army Groyne and the proposed extension of the existing groyne is unlikely to result in a significant change to these coastal processes. Although the proposed wharf will block longshore currents to a similar degree as the existing Army Groyne, there may be some potential for the following minor impacts: – Build-up of sediment on the eastern side of the proposed wharf when compared to the present condition. An estimate of the average sediment volume above the mean sea level (that which can be easily managed by land-based dredging methods) that is moving to the area between the transects on the east side of the groyne from winter to the summer peak is 800m^3. Future projected volumes moving west under longshore sediment transport (800m^3) are not expected to be affected by the proposed wharf structure. – There is potential for the accumulation of seagrass to occur on the eastern side of the proposed wharf, which may lead to ingress of seagrass to the harbour footprint. Baird estimates that the future volume of wrack which may accumulate on the eastern side of the groyne will be 1,600 m^3 per annum. Maintenance dredging and removal of this built up wrack material may be required every 2 to 5 years. **Reduction of wave energy in lee of structures** • Overall, the main changes in wave energy as a result of the proposed wharf is the reduction in wave height (when compared to the existing conditions) within the harbour basin area and some reduction in wave height along the shoreline on the western side of the wharf. Consequently, the proposal is unlikely to have a significant to coastal processes within the larger South Thomson Bay area. **Reflection of waves off structures resulting in increased wave energy in the structures vicinity** • The impact on wave conditions outside of the proposed wharf structure was determined to be minimal by Baird, with decreases in wave height being the main observation across each of the cases modelled. No detrimental increase in wave height caused by reflections from the breakwater structure is seen at the moorings managed by RIA (Baird, 2024).
Mitigation	**Avoid**	• The Army Groyne creates an existing barrier to longshore sediment transport. Therefore, as the proposed wharf will block longshore sediment transport to a similar degree to the existing Army Groyne, the proposal is not anticipated to result in a significant change in longshore sediment transport and significant impacts have been avoided. • Impacts on coastal process from marine structures cannot be completely avoided due to the nature of the proposal. • Overall, the main changes in wave energy as a result of the proposed wharf is the reduction in wave height (when compared to the existing conditions) within the harbour basin area and some reduction in wave height along the shoreline on the western side of the wharf.
	Minimise	**Interruption to longshore currents** • The proposed wharf structure has been subject to coastal processes modelling. • Monitoring of shoreline accretion and seagrass accumulation on the eastern side of the wharf will be undertaken as outlined in the OEMP (Appendix Q) and CHRMAP (Baird 2025) (Appendix W). As outlined in the CHRMAP (Baird 2025), a dedicated monitoring program will be implemented, particularly on the shoreline east of the development, to support the management of wrack and sediment. It is proposed this monitoring starts pre construction and be continued through the construction phase and into the operational phase. • The requirement for wrack removal will be determined by the annual monitoring outlined in the CHRMAP (Baird 2025) and OEMP. If required, wrack removal will be undertaken through mechanical means (excavator) along the eastern edge of the breakwater. Based on the assessment undertaken by Baird, the volume of wrack is likely to peak in between December and March. Disposal of wrack will occur either onshore or offshore, depending on seasonal conditions. If disposal occurs offshore, relevant licenses will be applied for as discussed in Section 14.3.4 of this report. • If monitoring of sediment accretion identifies the requirement for post development management of sedimentation, this will be undertaken via mechanical means (excavator) from the shoreline. The analysis undertaken by Baird (2025) indicates that the peak volume will occur in late summer (February / March). The removed sediment should be placed onto shorelines east of Thomson Bay between Army Groyne and Philip Point to mimic natural processes.

		• Implementation of the South Thomson Bay Barge Development CHRMAP (Baird 2025). **Reduction of wave energy in lee of structures** • The proposed wharf structure has been subject to coastal processes modelling. This modelling identified that changes are likely to be limited to: – The reduction in wave height (when compared to the existing conditions) within the harbour basin area – A small reduction in wave height along the shoreline on the western side of the wharf • As the vessels manoeuvre into or away from the facility within the turning circle, the waves would be 90 degrees to the vessel and further investigation into potential implications of this on the barge will be investigated as part of future detailed design • Implementation of the South Thomson Bay Barge Development CHRMAP (Baird 2025). **Reflection of waves off structures resulting in increased wave energy in the structures vicinity** • The proposed wharf structure has been subject to coastal processes modelling and the impact on wave conditions outside of the proposed wharf structure was determined to be minimal by Baird (2024).
	Rehabilitate	• Depending on the accumulation volume of wrack and the reshaping of the shoreline towards the protection nib on the eastern side of the wharf, the above maintenance and monitoring activities may need to be actioned (Baird, 2024a).
	Offset	Coastal processes offsets are not considered applicable to the proposal.
Residual impacts	• Due to the presence of the existing Army Groyne, residual impacts to longshore currents from the proposed wharf are unlikely to be significant and are limited to: – Sediment accretion and wrack accumulating on the eastern side of the wharf – A reduction of wave energy in lee of the wharf.	
Environmental outcomes	• No increase in wrack or sediment accumulation or beach erosion above natural levels on nearby beaches within South Thomson Bay which will result in a reduction in social amenity and recreational values (including odour). • No increase in wrack or sediment accumulation or beach erosion on nearby beaches within South Thomson Bay which will result in loss of roosting habitat for seabirds and shorebirds. • No increase in wrack or sediment accumulation or beach erosion on nearby beaches within South Thomson Bay beaches which will result in a reduction of the extent of BCH outside of the development envelope.	

Table 7: Summary of the potential impacts, proposed mitigation and outcomes – marine environmental quality

Marine environmental quality

EPA environmental objective	To maintain the quality of water, sediment and biota so that environmental values are protected.	
Relevant policy and guidance	• Environmental Factor Guideline: Marine Environmental Quality (EPA, 2016e) • Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016f) • Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA 2021a) • Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA 2021a) • Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand., 2018) • Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand., 2018) • Perth's Coastal Waters, Environmental Values and Objectives (EPA, 2000) • State Water Quality Management Strategy No.2, Implementation Plan: Status Report (Government of Western Australia, 2004) • Background quality for coastal marine waters of Perth, Western Australia (Department of Environment, 2004).	
Supporting technical investigations and reports	• South Thomson Barge Landing Development; Dredge Plume Modelling Assessment (Baird, 2025b) (Appendix F) • RIA Peer Review of Dredge Plume Modelling and Coastal Processes Reports (RPS, 2024c) (Appendix E) • Rottnest Island Authority has undertaken baseline water quality monitoring to support the proposal (Appendix G) • Rottnest Island Army Jetty Dredging; SAP Implementation report (RPS, 2020) (Appendix H).	
Potential environmental impacts	**Direct impacts**	**Temporary increase in total suspended solids** • Mobilisation of sediment during dredging activities, construction of the breakwater, reclamation and piling will result in a temporary increase in total suspended solids (TSS) within the following zones of impact. The zones of impact are shown in Figure 3: – Zone of High Impact (ZoHI) – The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'. The ZoHI is located within the development envelope and encompasses an area of 1.37 ha. – Zone of Moderate Impact (ZoMI) – The area within which predicted impacts on benthic communities or habitats are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the ZoHI. The ZoMI encompasses an area of 4.5 ha – Zone of Influence (ZoI) – The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI. The ZoI encompasses an area of 13.44 ha.
	Indirect impacts	**Temporary increase in total suspended solids** • Disturbance of sediments from vessel operations (including propeller wash) in shallow water may result in a temporary increase in suspended sediments during operation of the proposal • Temporary decease in light availability for benthic communities and habitats due to increased TSS. **Increased risk of pollution incidents** • Increased boat numbers during operation, and to lesser degree construction, of the proposal has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage • A fuel facility, including underground storage tanks is proposed as part of the proposal. There is a risk for fuel spills to occur during refuelling or from fuel storage facilities. Fuel spills from the fuel facility have the potential to impact marine environmental quality. **Temporary release of contaminants from marine sediment during dredging and reclamation activities** • The proposed dredging activities and resulting suspension of sediments have the potential to result in the temporary release of contaminants from sediments.
Mitigation	**Avoid**	• Dredging to a depth of RL -3 m will significantly avoid vessel operations disturbing sediments. • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3.
	Minimise	**Temporary increase in total suspended solids** • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3 • Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24. – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include:

Marine environmental quality

- Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP. This program specifies that if the triggers are exceeded, then the following management actions will be implemented to ensure impacts to marine environmental quality do not extend past the modelled zone of influence:
  - If trigger 1 has been exceeded:
    - Investigate if trigger 2 has been exceeded for any monitoring sites
    - Sample again at the exceeded monitoring site and associated reference site each day until turbidity has decreased.
  - If trigger 2 has been exceeded:
    - Assess metocean and weather conditions
    - Investigate if dredging or disposal has been occurring and if that is likely to be attributable to the exceedance
    - Investigate results of the other parameters to determine if there is likely to be stress on the surrounding seagrass.
    - Sample again at that monitoring site and associated reference site each day until turbidity has decreased.
  - If the trigger levels are exceeded (or indicate a progressive increase towards the trigger levels) then modifications to the dredging program are to be considered, and may include, but not necessarily be limited to the following actions. Modifications to the dredge program will continue until the trigger levels are no longer exceeded. If trigger level 2 is exceeded for two consecutive days, dredging will cease and Level 2 management actions, as outlined in the DEMMP, shall be implemented and dredging will only recommence after trigger level 1 is no longer exceeded:
    - Reactive benthic communities and habitats survey
    - Temporary pause to dredging activities (e.g. if exceedance appears to be due to factors other than dredging vessel movements, then pausing dredging activities will minimise cumulative effects)
    - Relocate the dredge (e.g. to an area of coarser sediment)
    - Reduce the dredge cut depth, rate of swing-speed and/or increase the dredge pump flow
    - Reduce disposal of material if the plume is coming from the reclamation area.
- Implementation of the tiered management framework provided in the DEMMP
- Use of silt curtains which will minimise the potential impacts associated with increased suspended sediments
- The placement of geofabric (such as Texcel 1200R®) textile weave along the bund wall will ensure that the placement of dredge spoil during reclamation works will not impact or increase the dredge plume zones.

Increased risk of pollution incidents from vessels and underground fuel storage leading to degradation of marine environmental quality

- Construction management measures to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the risk for hydrocarbon spills to the marine environment is minimal so that there are no adverse impacts to the marine environment. Should a spill occur, response, containment and cleanup will be undertaken in accordance with the Spill Prevention and Response Plan (RIA, 2025) provided as Appendix V.
- Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include:
  - Implement industry standard hydrocarbon management practices (chemical handling, storage, segregation, and spill response)
  - Any construction vessels including piling vessels/barges to establish a sewage and garbage disposal plan
  - Undertake vessel maintenance and bunkering in accordance with contractors approved vessel management systems
  - Hydrocarbon spills into the marine environment be immediately reported and appropriately remediated
- Operational management to minimise impacts to the marine environment is detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that:
  - Fuel / oil spill contingency plans are included in the OEMP and Spill Prevention and Response Plan (RIA, 2025) (Appendix V) and includes the provision of clean-up equipment and appropriate disposal of contaminated water and sediment
  - Pollution incidents will be reported to the DoT's Marine Environmental Emergency Response (MEER) unit, with clean up managed and monitored in accordance with MEER's requirements and Spill Prevention and Response Plan (RIA, 2025)
  - Pollution incidents will be monitored during operation in accordance with the OEMP, with contingency actions implemented should pollution triggers be breached on a reoccurring basis
  - No liquid waste to be discharged anywhere in Rottnest Island waters, including waste from marine sanitation devices
  - Implement standard waste minimisation and reduction strategies, including providing facilities for waste disposal
  - The underground fuel storage facility will be constructed in accordance with AS1940 and as outlined in the OEMP have safety and leak detection equipment installed.

Disturbance of sediments from vessel operations (including propeller wash) in shallow water results in a temporary increase in suspended sediments

- Operational management measures to minimise impacts to the marine environment are detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that marine users comply with vessel operational restrictions required by DoT and RIA.
- The monitoring program outlined in the OEMP (Appendix Q) includes quarterly water quality sampling and annual sediment quality sampling. This monitoring will be undertaken for the first two years of operations, and following this the frequency will be reviewed as necessary.

Temporary decease in light availability for benthic communities and habitats due to suspended sediments

- As discussed in Section 7, temporary impacts from suspended sediments on benthic communities are predicted in the ZoMI only. These impacts include temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack. Baird (2024b) predicts that impacts to these benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities
- Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that:
  - The area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24
  - Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging.
- Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.

Temporary release of contaminants from marine sediment during dredging and reclamation activities

- The risk of temporary release of contaminants from marine sediments during dredging and reclamation activities will be minimal as all baseline sediment results did not record contaminants above the assessment criteria
- Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24
- The CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction.

Disturbance of sediments from maintenance dredging during operation

- Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.

Rehabilitate

- Fuel and oil spills to be cleaned up in accordance with the contingency actions outlined in the Spill Prevention and Response Plan (RIA, 2025) (Appendix V), DEMMP, CEMP and OEMP.
- Impacts to marine water quality from an increase in TSS within the ZoMI and ZoI will be temporary only.

Marine environmental quality		
		• Impacts to marine water quality from operational activities will be temporary only (during vessel use) and due to the proposed design are considered unlikely to be significant. No rehabilitation is considered applicable.
	Offset	Marine environmental quality offsets are not considered applicable to the proposal.
Residual impacts	• Temporary suspended sediments within the ZoHI (1.37 ha), ZoMI (4.5 ha) and ZoI (13.44 ha) • Temporary reduction in light due to suspended sediments in the water column within the ZoMI (4.5 ha) may impact benthic communities and habitats. As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, these residual impacts are not considered significant.	
Environmental outcomes	**Environmental outcomes for construction of the proposal:** • Within two weeks following cessation of marine construction and dredging works, marine water quality will return to a High Level of Ecological Protection. • No reported hydrocarbon spills or release of waste into the marine environment from construction/dredging activities. **Environmental outcomes for operation of the proposal:** • No reported hydrocarbon spills or release of waste into the marine environment from operational activities. • No reduction in marine environmental quality (water, sediment and biota) from a High Level of Ecological Protection within and adjacent to the development envelope as a result of the proposal. • If maintenance dredging is undertaken, marine environmental quality (i.e. water and sediment quality) will remain consistent with triggers outlined in the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken).	

Table 8: Summary of the potential impacts, proposed mitigation and outcomes – marine fauna

Marine fauna		
EPA environmental objective	To protect marine fauna so that biological diversity and ecological integrity are maintained.	
Relevant policy and guidance	• *Environment Protection and Biodiversity Conservation Act 1999* • *Biodiversity Conservation Act 2016* • Environmental Factor Guideline: Marine Fauna (EPA, 2016j) • National Biofouling Management Guidelines for Non-trading Vessels (Commonwealth of Australia, 2009a) • National Biofouling Management Guidelines for Commercial Vessels (Commonwealth of Australia, 2009b).	
Supporting technical investigations and reports	• South Thomson Barge Landing Development; Marine fauna and benthic habitat assessment (RPS, 2024a) (Appendix B) • South Thomson Barge Landing Development; Underwater Acoustic Assessment (Tetra Tech, 2024) (Appendix S).	
Potential environmental impacts	**Direct impacts**	**Loss of benthic habitats** • Loss of marine fauna habitat, primarily the loss of seagrass species associated with construction of the proposal has the potential to result in impacts to marine fauna species through loss of foraging opportunities and changes to marine environmental quality. • The total predicted loss of marine fauna habitat from the proposal is summarised below: – Direct (permanent) impacts to 2.06 ha of mixed seagrass and 1.26 ha of sand / sand with wrack within the development envelope. The permanent loss of 2.06 ha of mixed seagrass accounts for 0.52% of mixed seagrass within the LAU – Indirect (recoverable) impacts to: ○ 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI will recover within a five-year period ○ 5.13 ha of mixed seagrass, 1.13 ha macroalgae dominated community, 0.35 ha of limestone reef / pavement and 6.70 ha of sand / sand with wrack within the ZoI. Changes in environmental quality associated with dredge plumes in the ZoI are not predicted to result in a detectible impact on benthic biota. **Increased risk of entanglement and / or entrainment** • Entanglement of marine fauna with equipment and waste during construction and operation of the proposal may lead to injury, death, displacement, adverse behavioural and physiological changes. • Entrainment, the direct uptake of aquatic organisms by suction, during activities such as dredging has the potential to cause mortality to marine fauna species during construction. **Elevated underwater noise** • Elevated levels of anthropogenic underwater noise can have negative impacts, ranging from changes in acoustic communication, displacement from an area, and in more severe cases temporary hearing loss, physical injury or mortality (Richardson, 1995). The greatest source of noise from the proposal will be associated with piling during construction. Dredging is anticipated to emit similar, or lesser, levels of noise. Other construction noise generated, such as rock dumping and construction vessel movement, is likely to be considerably less than pile driving and the impact from these other sources would be very low. **Risk of vessel collision** • An increased risk of collision could result from an increase in the number of vessels using the South Thomson Bay Barge Landing during operation and to a lesser degree during construction. However, as barge movements already occur between the mainland and existing jetty in Thomson Bay, the proposal will not result in any changes in risk of vessel strike during the operational phase. • The risk of vessel strike during construction activities is low as the construction vessels will operate slowly and within the development envelope only. **Risk of injury or death from rock dumping during breakwater construction** • Increased risk of injury/mortality of marine fauna. **Potential impacts from artificial lighting** • Increased light emissions during operation of the proposal could lead to disturbance to marine fauna in the vicinity, especially shorebirds and seabirds. • The potential for artificial light emissions to impact shorebirds and seabirds during construction is considered to be low, as construction works will be undertaken during nominated daylight hours, with lighting requirements limited to security / safety installations.
	Indirect impacts	**Increased risk of introduction of Introduced Marine Species (IMS)** • There is a risk of IMS introduction or spread during construction and operation of the proposal from vessel ballast water and hull fouling. Marine pests may threaten biodiversity through a number of mechanisms such as predation, competition for habitat and altering ecosystems. • Implementation of the proposal would not result in a major change in the activities that already exist on Wadjemup / Rottnest Island as the proposal involves moving the barging facilities to the proposed location from the existing jetty, rather than introducing a new activity to the island. **Increased risk of pollution incidents** • Increased boat numbers during operation, and to lesser degree construction, of the proposal has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage. • A fuel facility, including underground storage tanks is proposed as part of the proposal. There is a risk for fuel spills to occur during refuelling or from fuel storage facilities. Fuel spills from the fuel facility have the potential to impact marine environmental quality. • Likely effects of release of contaminants into the marine environment may result in direct impacts through ingestion, inhalation and absorption through the skin, and abandonment of polluted feeding habitat and potentially longer-term impacts from bioaccumulation in the food chain. **Loss of benthic habitats** • Loss of marine fauna habitat, primarily the loss of seagrass species associated with construction of the proposal has the potential to result in impacts to marine fauna species through loss of foraging opportunities and changes to marine environmental quality. The temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI from an increase in TSS. **Temporary increase in turbidity**

Marine fauna

		• A temporary increase in TSS within the ZoMI and ZoI has the potential to result in behavioural changes to marine fauna and impacts to benthic marine organisms.
Mitigation	**Avoid**	• Avoiding construction activities during known critical spatial and temporal windows of marine environmental sensitivity will avoid significant impacts to marine fauna species. These critical windows are outlined in Table 50. However, it is not anticipated that impacts to marine species can be fully avoided during construction activities. • Site selection includes an already disturbed area of 0.19 ha of seabed within the existing Army Groyne footprint. As benthic communities and habitats are widespread within South Thomson Bay, total avoidance of direct impacts is not possible. • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3 • Using vibro hammer piling methods (rather than hammer piling) will eliminate sources of impulsive underwater noise. • General construction work will be limited to daylight hours only, minimising potential disturbance from marine fauna from artificial light.
	Minimise	**Temporary / permanent loss or degradation of benthic habitat** • Management and mitigation proposed during construction to minimise impacts to marine fauna habitat such as benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area of benthic habitat affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI. – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP. • Operational management to minimise impacts to marine fauna is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Key management measures outlined in the OEMP includes: – Benthic communities and habitat monitoring in accordance with the benthic communities and habitat monitoring program provided in the OEMP – Quarterly water quality sampling and annual sediment quality sampling over an annual reporting period for the first two years of operations and following this the frequency will be reviewed as necessary. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities. **Increased risk of entanglement and / or entrainment** • Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address increased risk of entanglement and entrainment during construction. Management measures to minimise the risk of injury to fauna during construction includes: – Dedicated MFOs during dredging will implement management measures to minimise the risk of injury to fauna. Where marine fauna are observed within an Exclusion Zone, dredging will cease immediately. – Prior to commencing dredging or excavating, dedicated MFOs will check for marine fauna within the exclusion and observation zones outlined in the CEMP. – Dredging activities will be undertaken during daylight hours only to improve visibility. – Measures to minimise the risk for entanglement of marine fauna with waste and equipment during construction. • Implementation of the OEMP (Emerge, 2025b) (Appendix Q) provides the monitoring and management framework to address increased risk of entanglement during operation. • During operation of the proposal, the risk of entanglement will be minimised through installation of information-boards to encourage appropriate disposal of litter and the inform of the dangers of entanglement. **Elevated underwater noise** • Implementation of the CEMP (Emerge, 2025a) (Appendix P) provides the monitoring and management framework to address elevated underwater noise generated from construction activities, such as dredging and piling. Implementation of this management plan will ensure that: – There is no injury or death of marine fauna associated with underwater noise generated during construction of the proposal. – There is no injury or death of marine fauna from underwater noise. • Key management and monitoring measures included in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). are: – Trained marine fauna observers (MFOs) will minimise the risk of injury to marine fauna during piling. – A reduction in underwater noise impacts to marine fauna will be achieved through the use of vibration piling rather than hammer piling during construction. The reduction in underwater noise levels can be seen in the comparison of the underwater noise modelling shown in Figure 39 and Figure 40. – Hammer piling will only be used as a contingency if there is a refusal during vibro-piling. Exclusion zones for this contingency are included in the CEMP. – Pre-start, soft-start, shut-down and low-visibility procedures will be implemented as outlined in the CEMP. These are summarised below and detailed in Appendix B of the CEMP: ○ Prior to piling works each day and for each pile the dedicated MFOs will commence continuous visual observation within the observation and exclusion zones for 30 minutes. ○ Soft-start procedures involve the commencement of piling at low vibro-hammer energy, gradually increasing to full energy over a 30-minute period. Where target marine fauna are not observed in the observation and exclusion zones during the soft-start procedures, then normal piling can commence. ○ Where marine fauna is observed by the MFO within the observation zone (but outside the exclusion zone) during piling activities (including soft-start procedures), then the shutdown procedures outlined in the CEMP will be implemented. ○ During periods of low visibility (i.e. where a distance of 500 m cannot be clearly viewed), then piling operations may commence with soft-start procedures, unless one of the triggers provided in the CEMP occurs. – Implementation of observation and exclusion zones. The observation zones have been designed to encompass the modelled Temporary Threshold Shift (Section 10.5.1.5) and the exclusion zones have been designed to encompass the Permanent Threshold Shift (Section 10.5.1.5). The management zones are depicted in Appendix B (Marine Fauna Provisions) of the CEMP. – Piling will only be undertaken during daylight hours to ensure visibility of the observation and exclusion zones for the MFO. • Trained MFOs will be on duty (as outlined in Appendix B of the CEMP) on vessels during construction. **Risk of vessel collision** • Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address increased vessel collision risk during construction. Implementation of this management plan will ensure that there is no death or injury to marine fauna from vessel strike. Management measures that will be implemented include: – Implementation of vessel speed limits – All vessels are to adhere to standards set in the National Whale Watching Guidelines – A MFO on all construction vessels when in transit – Implementation of vessel approach distances to marine fauna – Implementation of the marine fauna monitoring and management program provided in Appendix B.3 of the DEMMP. • Implementation of the OEMP (Emerge, 2025b) (Appendix Q) provides the monitoring and management framework to address increased vessel collision risk during operation. Implementation of this management plan will ensure that: – Marine users to comply with vessel operational restrictions required by DoT and RIA

Marine fauna

		Risk of injury or death from rock dumping during breakwater construction The CEMP (Emerge, 2025a) (Appendix P) outlines the management and monitoring measures to mitigate the potential impacts of rock dumping and excavation on conservation significant marine fauna. These measures include: – Dedicated MFOs during rock dumping activities will implement management measures to minimise the risk of injury to fauna as outlined in Appendix A (Marine Fauna Provisions) of the CEMP, including: – Prior to rock dumping and excavation works, the dedicated MFOs will commence continuous visual observation within the specified Management Zones for 30 minutes. If target marine fauna is observed within the management zone during this time, rock dumping and excavation shall be delayed until the marine fauna has been observed exiting the Observation Zone or have not been seen for 30 minutes. – Once rock dumping has commenced, if the dedicated MFOs observe a target marine fauna species within the Exclusion Zones then shut-down procedures will be implemented. – During periods of low visibility (i.e. where a distance of 500 m cannot be clearly viewed), then rock dumping and excavation activities may commence with soft-start procedures. – Rock dumping, dredging and excavation activities will be undertaken during daylight hours only to improve visibility. **Potential impacts from artificial lighting** • Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to minimise impacts to marine fauna from increased light emissions during construction. The key management measure to ensure no disturbance to marine fauna from artificial light during construction is: – Construction activities will be restricted to daylight hours. • Operational management to minimise impacts to marine fauna is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Artificial lighting will be of lowest allowable intensity to meet legislative and regulatory requirements for human safety / navigational purposes. • Best practice lighting design consistent with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) will be employed to reduce light pollution on marine fauna during operation, including: – Only add light for specific purposes (e.g. navigational and safety). – Use adaptive light controls to manage light timing, intensity and colour. – Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill. – Use the lowest intensity lighting appropriate for the task. – Use non-reflective, dark-coloured surfaces. – Use lights with reduced or filtered blue, violet and ultra-violet wavelengths. – Lighting will be directed to light specified areas of the facility. – Lighting on the facility will be kept to a minimum that is required for safe operation for vessels and infrastructure. **Increased risk of introduction of IMS** • Implementation of the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and OEMP (Appendix Q) will minimise the risk of introduction of IMS. • The proposal will be primarily used for barge operations to transport bulk cargo to and from Wadjemup / Rottnest Island. As such, the likelihood of vessels visiting the facility from international or interstate waters is low. However, any vessels from interstate or international waters will comply with Commonwealth biosecurity requirements and complete the WA Department of Primary Industries and Regional Development 'Vessel Check' risk assessment (https://vesselcheck.fish.wa.gov.au). The risk assessment must indicate that the vessel poses a low risk of IMS. • All vessels will have a ballast water management plan and ballast water exchanges will be in accordance with IMO requirements and the *Commonwealth Biosecurity Act 2015*. **Increased risk of pollution incidents** • Construction management measures to minimise the risk of pollution incidents which may impact marine fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the risk for hydrocarbon spills to the marine environment is minimal so that there are no adverse impacts to marine fauna. • Key management and monitoring measures include: – Implement industry standard hydrocarbon management practices (chemical handling, storage, segregation, and spill response). – Any construction vessels including piling vessels/barges is to establish a sewage and garbage disposal plan. – Undertake vessel maintenance and bunkering in accordance with contractors approved vessel management systems. – Hydrocarbon spills into the marine environment be immediately reported and appropriately remediated. • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that: – Fuel / oil spill contingency plans are included in the OEMP, and includes the provision of clean-up equipment and appropriate disposal of contaminated water and sediment. – Pollution incidents will be reported to the DoT's MEER unit, with clean up managed and monitored in accordance with MEER's requirements. – Pollution incidents will be monitored during operation in accordance with the OEMP, with contingency actions implemented should pollution triggers be breached on a reoccurring basis. • Should a spill occur, response, containment and cleanup will be undertaken in accordance with the Spill Prevention and Response Plan (RIA, 2025) provided as Appendix V. • The underground fuel storage facility will be constructed in accordance with AS1940 and as outlined in the OEMP have safety and leak detection equipment installed. **Temporary increase in turbidity** • Management and mitigation proposed during construction to minimise impacts to marine fauna habitat such as benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of construction activities. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP. • Implementation of the OEMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – A benthic infauna monitoring program – A quarterly water quality sampling and annual sediment quality sampling for the first two years of operations and following this the frequency will be reviewed as necessary. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.
	Rehabilitate	• There is no opportunity to rehabilitate the impacted area due to operation and maintenance of the proposal. Construction effects (outside the development envelope) to marine fauna habitat (benthic communities and habitats) will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities. • Sick and/or injured fauna shall be managed by appropriately qualified personnel and any injury or death of marine fauna will be reported to the Department of Biodiversity, Conservation and Attractions (DBCA). • Fuel and oil spills to be cleaned up in accordance with the contingency actions outlined in the DEMMP, CEMP and OEMP.
	Offset	Marine fauna offsets are not considered applicable to the proposal.
Residual impacts	• Impacts to the following benthic communities and habitats within the development envelope and modelled ZoMI from an increase in suspended sediments results in a decrease in potential marine fauna habitat available:	

Marine fauna	
	– Direct (permanent) impacts to 1.98 ha of mixed seagrass and 0.87 ha of sand / sand with wrack within the development envelope – Direct (recoverable) impacts to 0.08 ha of mixed seagrass and 0.39 ha of sand / sand with wrack within the development envelope from the mooring of construction vessels – Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. • Underwater noise emissions from construction activities such as piling and dredging causing temporary disturbance to marine fauna species.
Environmental outcomes	**Environmental outcomes for construction of the proposal** • Irreversible impacts to marine fauna habitat are limited to the wharf structure and ZoHI. • No reported introduction or establishment of IMS as a result of construction activities associated with the proposal. • No reported impacts to marine fauna as a result of hydrocarbon spill or release of waste associated with construction activities, including entanglement or ingestion of waste. • No reported behavioural changes which are known to be associated with distress or injury of marine fauna, health impacts (including temporary or permanent hearing loss), physical injury or mortality from underwater noise emissions from construction activities to significant marine fauna species. • No reported death or injury to marine fauna from vessel strike within the Rottnest Island Marine Reserve Boundary which is associated with the Rottnest Barge Landing Development construction. • No changes in marine fauna behaviour attributable to the construction lighting requirements of the proposal. **Environmental outcomes for operation of the proposal** • No reported loss of marine fauna habitat outside of the development envelope attributable to the operations of the proposal. • No reported introduction or establishment of IMS as a result of operational activities associated with the proposal. • No reported impacts to marine fauna as a result of hydrocarbon spill or release of waste associated with operational activities including entanglement or ingestion of waste. • No reported death or injury to marine fauna from vessel strike or other activities within the Rottnest Island Marine Reserve Boundary associated with operational activities. • No changes in marine fauna behaviour attributable to the lighting requirements of the Proposal associated with operations.

Table 9: Summary of the potential impacts, proposed mitigation and outcomes – flora and vegetation

Flora and vegetation		
EPA environmental objective	To protect flora and vegetation so that biological diversity and ecological integrity is maintained.	
Relevant policy and guidance	• Environmental Factor Guideline – Flora and Vegetation (EPA, 2016a) • Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b) • *Environment Protection and Biodiversity Conservation Act 1999* • *Biodiversity Conservation Act 2016*	
Supporting technical investigations and reports	• Flora and vegetation survey; South Thomson and Kingstown, Rottnest Island (FVC, 2023) (Appendix I) • South Thomson Barge Redevelopment Flora and Vegetation Survey (RPS, 2024d) (Appendix J)	
Potential environmental impacts	**Direct impacts**	**Removal of native vegetation** • Removal of 0.46 ha of native vegetation in Good to Degraded condition • Of the native vegetation being cleared, 0.23 ha is analogous with the threatened ecological community (TEC); *Callitris preissii (or Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.
	Indirect impacts	**Introduction of invasive species (pests and weeds)** • There is potential for the movement of construction machinery to result in the introduction of weed and pest species. **Introduction of disease** • There is potential for the movement of construction machinery to result in the introduction of disease. **Accidental clearing** • During construction activities, there is a risk that native vegetation outside the areas directly impacted will be accidentally cleared. **Localised erosion** • There is a risk for localised erosion to occur adjacent to cleared areas or due to surface water run-off. Localised erosion may impact vegetation adjacent to the development envelope. **Incorrect waste disposal** • Potential vegetation degradation through the incorrect disposal of rubbish and waste.
Mitigation	**Avoid**	• Avoidance of impacts to the 0.8 ha of native vegetation analogous with the TEC (MlAp*Td) surveyed outside the development envelope.
	Minimise	**Removal of native vegetation** • A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to native vegetation is limited to the 0.46 ha within the development envelope. Management measures to limit impacts outside the development envelope include: – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid accidental clearing or disturbance of surrounding vegetation – All identified populations of MlAp*Td will be delineated using highly visible flagging or similar around all identified populations to avoid impacts to the 0.8 ha of MlAp*Td surveyed outside the development envelope – Establishment of clearly delineated access points to prevent unauthorised disturbance and access – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area – Daily inspections to visually check / review clearing boundaries and compliance during clearing activities – Photographic records of the clearing area pre- and post-clearing activities – Inspection to verify no degradation or disturbance beyond approved clearing boundary from erosion. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access. – There is no introduction of weed species to the site as a result of operation. – Biannual inspection of vegetation up to 25 m surrounding the development envelope to monitor vegetation condition. – Assessment of any internal Rottnest Island Authority vegetation removal request forms to ensure pruning or removal of vegetation is controlled in areas proximate to the development envelope. **Introduction of invasive species (pests and weeds)** • Construction management and monitoring measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Implementation of the weed management protocol as outlined in the CEMP – Weekly inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species, including: – Weekly spot checks of mobile equipment and vehicles – hygiene points at key road entry points – Implementation of the weed management protocol outlined in the CEMP

Flora and vegetation

		– Stockpile management, including stockpile locations (within the development envelope), erosion and stabilisation techniques and height limits – Designated areas for the temporary placement of cleared vegetation (within the development envelope) to minimise the increased risk of weed and disease spread and bushfire – The contractor will supply weed and weed certificates prior to mobilising vehicles and machinery. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of weed species to the site as a result of operation. – Biannual inspection of vegetation up to 25 metres (m) surrounding the development envelope to monitor for weeds. • Key management measures outlined in the OEMP (Emerge, 2025b) (Appendix Q) to avoid indirect impacts to native vegetation (inclusive of the TEC) adjacent to the proposal includes: – Vehicle access will be clearly marked and restricted to designated roads and paths. If observations / incidents of vehicle related impacts on flora and vegetation are reported, then further contingency actions will be implemented. These include additional staff education and installation of barrier fencing and bollards – Waste disposal measures such as provision of suitable bins and clean up of any windblown rubbish will be implemented to prevent an increase in litter impact on surrounding vegetation. **Introduction of disease** • Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Appropriate hygiene measures to minimise the risk of the spread and introduction of disease – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid the risk of disease spread • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of disease to the site as a result of operation – Biannual inspection of vegetation up to 25 m surrounding the development envelope to monitor vegetation condition. **Accidental clearing** • Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope. **Localised erosion** • Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works will minimise localised erosion – Establishment of clearly delineated access points to prevent unauthorised disturbance and access • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope. **Degradation through incorrect waste disposal** • A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to native vegetation is limited to the 0.46 ha within the development envelope. Measures to manage waste disposal will be implemented as per the CEMP to minimise the risk for degradation of the surrounding vegetation. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that waste disposal measures are implemented to prevent rubbish and litter degrading surrounding vegetation.
	Rehabilitate	• Should the proposal result in the introduction of weed species, appropriate management and control measures will be implemented. • Should the proposal result in the introduction of disease, appropriate management measures will be implemented. • There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal. However, any accidental clearing will be rehabilitated. • If daily inspections during construction identifies areas of erosion outside the development envelope which impacts vegetation condition, these areas will be rehabilitated.
	Offset	Terrestrial flora and vegetation offsets are not proposed for terrestrial flora and vegetation as only 0.52% of the TEC identified in the surrounding area will be directly impacted.
Residual impacts	Removal of 0.46 ha of native vegetation in Good to Degraded condition. Of the native vegetation being cleared, 0.23 ha is analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.	
Environmental outcomes	• Direct impacts to native vegetation resulting from the proposal will be confined to the development envelope. • Direct impacts to native vegetation (MIAp*Td) analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain will be confined to the development envelope and will not exceed 0.23 ha. • No reduction in the extent or modification of the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain outside the development envelope as a result of the proposal. • No introduction of new weed species attributable to the proposal.	

Table 10: Summary of the potential impacts, proposed mitigation and outcomes – terrestrial fauna

Terrestrial fauna

EPA environmental objective	To protect terrestrial fauna so that biological diversity and ecological integrity are protected (EPA, 2016d).
Relevant policy and guidance	• Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016d) • Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020) • *Environment Protection and Biodiversity Conservation Act 1999* • *Biodiversity Conservation Act 2016.*

Terrestrial fauna

Supporting technical investigations and reports	• Rottnest Island Basic Fauna Survey (EcoLogical, 2024) (Appendix K).	
Potential environmental impacts	**Direct impacts**	**Loss of terrestrial fauna habitat** • Construction of the proposal will result in the removal of 0.46 ha of potential terrestrial fauna habitat. Conservation significant species that may occur within this habitat includes: – *Lerista lineata* (Perth slider) – *Pandion haliaetus* (osprey) – *Pseudonaja affinis exilis* (Rottnest Island dugite) – *Tiliqua rugosa konowi* (Rottnest Island bobtail) – *Setonix brachyurus* (quokka). **Injury and / or mortality of terrestrial fauna** • Construction of the proposal may result in increased vehicle movements within the development envelope, resulting in vehicle strike. • It is unlikely operation of the proposal will significantly increase the potential for fauna strike, given the existing presence of roads within the area.
	Indirect impacts	**Alteration of fauna behaviour** • During construction, there will be noise and vibration emissions due to vehicles movements and construction activities. Noise and vibration associated with construction of the proposal have the potential to result in short-term disturbance to fauna on a local scale. **Indirect loss or impact to terrestrial fauna habitat from habitat degradation** • Indirect loss or impact to terrestrial fauna habitat from habitat degradation as a result of: – The introduction or spread of invasive species (pests and weeds) due to construction machinery and vehicles – The introduction or spread of disease (for example, dieback) due to construction machinery and vehicles – Inappropriate disposal of waste. **Accidental clearing of potential fauna habitat** • During construction activities, there is a risk that terrestrial fauna habitat outside the areas directly impacted will be accidentally cleared.
Mitigation	**Avoid**	Complete avoidance of impacts to terrestrial fauna and habitat cannot be achieved.
	Minimise	**Loss of terrestrial fauna habitat** • A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to terrestrial fauna habitat is limited to the 0.46 ha within the development envelope. Management measures to minimise potential impacts outside the development envelope are discussed in this table. **Habitat degradation from the introduction and spread of weeds and disease and incorrect waste disposal** • Construction management and monitoring measures to minimise impacts to terrestrial fauna habitat are detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid the risk of weed spread – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species: – Weekly spot checks of mobile equipment and vehicles – Hygiene points at key road entry points – Implementation of the weed management protocol outlined in the CEMP – Stockpile management, including stockpile locations (within the development envelope), erosion and stabilisation techniques and height limits – Designated areas for the temporary placement of cleared vegetation (within the development envelope) to minimise the increased risk of weed and disease spread and bushfire • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of weed species to the site as a result of operation. **Accidental clearing of potential fauna habitat** • Construction management measures to minimise impacts to terrestrial fauna habitat is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area • Monitoring during construction to minimise impacts to terrestrial fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope. **Injury and / or mortality of terrestrial fauna** • Construction management measures to minimise impacts to terrestrial fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Vegetation clearing will be undertaken progressively and towards retained vegetation – Vehicle speed limits will be implemented in accordance with the CEMP – If native fauna is encountered during clearing works it should, initially, be allowed to make its own way from the works area. However, if this is not possible or practicable, a qualified wildlife handler will be contacted to relocate it • It is unlikely operation of the proposal will significantly increase the potential for fauna strike, given the existing presence of roads within the area. The OEMP (Appendix Q) outlines measures to minimise the risk of injury to terrestrial fauna during operation.
	Rehabilitate	• Should the proposal result in the introduction of weed species, appropriate management and control measures will be implemented. • There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal. Any accidental clearing outside the approved area will be rehabilitated. • Injured animals will be provided with first aid and handled on advice from the Wildcare Helpline and Rottnest Island Authority rangers.
	Offset	Terrestrial fauna offsets are not considered applicable to the proposal.
Residual impacts	• Removal of 0.46 ha of potential terrestrial fauna habitat in Good to Degraded condition.	
Environmental outcomes	• No project related disturbance of conservation significant terrestrial fauna or conservation significant fauna habitat outside of the development envelope. • No introduction of new weed species attributable to the proposal. • No increase in incidents of terrestrial fauna injury or death during construction associated with the proposal.	

Table 11: Summary of the potential impacts, proposed mitigation and outcomes – social surroundings

Social surroundings

EPA environmental objective		To protect social surroundings from significant harm (EPA, 2023).
Relevant policy and guidance		• *Aboriginal Heritage Act 1972* • Environmental Factor Guideline – Social Surroundings (EPA, 2023) • Technical Guidance Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA, 2023b) • *Historic Shipwrecks Act 1976* • *Maritime Archaeology Act 1973* • *Heritage Act 2018.*
Supporting technical investigations and reports		• Report of an Ethnographic Aboriginal Heritage Survey of the Army Jetty, Rottnest Island, Western Australia (Brad Goode and Associates, 2019) (Appendix M) • Marine Magnetic survey at proposed barge landing site, South Thomson Bay (Surrich, 2019) (Appendix T) • Acoustic assessment Rottnest Barge Facility Rottnest Island (Herring Storer, 2024) (Appendix U).
Potential environmental impacts	**Direct impacts**	**Potential impacts to heritage** • There are no registered Aboriginal Cultural Heritage (ACH) sites within or adjacent to the development envelope. However, there is a risk for previously unearthed artefacts or burials to be identified during ground disturbing activities. • Although not a registered heritage site, there are community concerns regarding impacts to potential heritage values of the existing Arm Groyne. **Impacts to recreational values** • Construction and operation of the proposal will require the temporary and permanent relocation of some moorings during construction and operation as summarised below: – Temporary relocation of eight moorings during construction of the proposal – Permanent relocation of four moorings during operation of the proposal. **Potential disturbance of unexploded ordnance (UXO)** • The marine component of the development envelope was not mapped as having a risk of UXO occurring. However, the marine environment approximately 3 km to the north-west of the site is at risk of UXO occurring. • Surrich Hydrographics (Surrich) undertook a magnetic field survey for UXO to delineate the risks within the development envelope. The survey identified 48 ferrous debris targets, six of which were confirmed to be debris and not UXO.
	Indirect impacts	**Impacts to recreational values** • Loss of marine habitat, primarily the loss of seagrass associated with construction of the proposal has the potential to result in indirect impacts to marine fauna species through loss of foraging opportunities and changes to marine environmental quality. This loss of marine habitat may impact recreational fisheries in the South Thomson Bay through the loss of potential feeding and spawning habitat. • Construction of the proposal has potential to impact public safety. **Impact to amenity** • Construction and implementation of the proposal has the potential to impact amenity within vicinity of the development envelope from noise emissions. • Construction of the proposal has the potential to impact visual amenity within vicinity of the development envelope.
Mitigation	**Avoid**	• The proposed upgrades to the Army Groyne will reduce public safety risks and improve the overall visitor arrival experience. • The Department of Transport (DoT) determined that a navigational channel and markers were not required and that the risk to boating users from the relocation of barge traffic is not expected to be significant. • There are no registered Aboriginal cultural heritage (ACH) sites within the development envelope. • Consultation with representatives of the Whadjuk NTC group confirmed that the proposal can proceed without undue risk of breaching the *Aboriginal Heritage Act 1972* in relation to ethnographic sites and places. • Additional consultation was undertaken with SWALSC, WCAC and WARG in 2024.
	Minimise	**Potential impacts to previously unidentified Aboriginal cultural heritage** • To minimise potential impacts to any previously unidentified subsurface ACH, the following actions will be implemented as per the recommendations from the Aboriginal groups that were consulted: – Archaeological monitors are present during all ground disturbing works and that archaeological techniques, such as test pitting and sieving, are employed if artefacts are found. – A proprietary ritual (Welcome to Country and Smoking Ceremony) will be performed prior to the works occurring. – Interpretative signage will be installed at the site to provide people visiting the island with more information about Aboriginal history of the area. – Availability to hold Smoking ceremonies throughout the project should the Whadjuk Traditional Owners request the need to do so. – Cultural heritage 'Welcome to Country' for all project members to be undertaken by a senior Whadjuk Elder at the commencement of construction, covering spiritual, physical and intangible values – Cultural heritage inductions to be undertaken by an RIA Heritage person for new project members after commencement. • Ongoing consultation will be undertaken with Traditional Owners as required to determine additional Aboriginal heritage information about potential sites. **Impacts to recreational values (recreational fishing)** • Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area of benthic communities and habitats permanently impacted by the proposal is limited to the development envelope. • Management and mitigation proposed during construction to minimise impacts to marine environmental quality, which may result in impacts to recreational fishing, is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area affected by reduced water quality (suspended sediments) during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within 2 weeks following completion of dredging • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction which may indirectly impact recreational fishing values. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP for suspended sediment – Inspections of all dredge equipment to check for leaks or damage • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Emerge, 2025b) (Appendix Q). • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint where possible. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the document Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities. • Marine users to comply with vessel operational restrictions required by DoT and RIA. **Impacts to recreational values (public safety)** • Implementation of the CEMP provides the monitoring and management framework to minimise risks to public safety during construction. Key management and monitoring measures include: – Equipment will be fitted with noise control devices where possible and appropriate. – Implementation of vehicle speed limits. – Installation of floating markers and signs to limit access to the construction areas within both the marine and terrestrial environment.

Social surroundings

		• Operational management to minimise impacts to the marine environment is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Installation of floating markers and signs at the entrance to the barge landing (within development footprint) to prevent boat anchorage and swimming. This will ensure that an increase in vessel movements does not impact public safety. – Physical inspections during operations – Maintenance of a complaints register – Public safety risk (i.e. traffic along Parker Point Rd) is addressed by policing and road regulations applicable to Wadjemup / Rottnest Island roads – Marine users to comply with vessel operational restrictions required by DoT and RIA. **Relocation of moorings (permanent and temporary)** • No moorings will be permanently removed and disruption to moorings users will be minimised through: – Temporary relocation of eight moorings during construction of the proposal. The temporary relocation will be undertaken prior to construction commencing to minimise disruption to users. The relocation will be for the duration of construction, for approximately 18 months – The permanent relocation of four moorings will be undertaken prior to construction to minimise disruption to users. • Ongoing stakeholder consultation with the local community regarding the proposal and potential impacts on social surroundings. **Impacts to amenity** • Ongoing stakeholder consultation with the local community regarding the proposal and potential impacts on social surroundings. • As there is an existing groyne within the development envelope, extension of this groyne to support the proposal is unlikely to result in a significant change to visual amenity. • An airborne noise assessment was undertaken of the current barge operations (Appendix U). Noise emissions from the existing operations at the Rottnest Barge Facility comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997 at all times (Herring Storer, 2024). As the existing barge operations comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997, it is predicted that the relocated operations will also comply with the regulations and no significant noise impacts from the proposal are anticipated. • Management targets and actions to minimise potential impacts to amenity from increase in noise, lighting, odour and dust from construction of the proposal are outlined in the CEMP (Appendix P). The management targets include: – Noise emissions do not exceed assigned noise levels as prescribed in the Environmental Protection (Noise) Regulations 1997 – No fugitive dust emission outside of the development envelope – Zero incidences of fire resulting from the proposal. • Key management measures outlined in the CEMP to achieve these targets include: – Construction contractor specifications will require that all construction work will be carried out in accordance with control of noise practices set out in Section 4 of Australian Standard 2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites – Vehicle operation will occur during prescribed hours (between 7.:00 am and 7.00 pm) – Equipment will be fitted with noise control devices where possible and appropriate – Implement dust suppression measures – Enforce speed limits – Provision of facilities to ensure waste is appropriately disposed of. • Management targets and actions to minimise potential impacts to amenity from increase in noise, lighting, odour and dust from construction of the proposal are outlined in the OEMP (Emerge, 2025b) (Appendix Q). The management targets include: – Limit the impact on social surroundings, including noise, dust and visual intrusion through controlled vehicle movement procedures, to avoid public and community issues. – Limit issues related to freight operations that may cause potential negative impacts on social surroundings. – Ensure waste disposal measures and prevent rubbish and litter impact on visual amenity. – Ensure local amenity is protected and public safety measures are undertaken. • Key management measures outlined in the OEMP to achieve these targets include: – Dust management measures: ○ Vehicle movements will be restricted to the designated access roads to minimise dust impacts to surrounding users. ○ Vehicle speeds will be restricted to minimise the generation of dust. – Waste management measures: ○ Ensure all waste is either recycled or moved off site to the Island disposal facility. – Noise management measures: ○ Equipment will be fitted with noise control devices where possible and appropriate. – Lighting management measures: ○ The use of lighting at night will be for safety purposes only and will be designed to minimise impacts to surrounding users as much as possible. ○ Adaptive light controls to manage light timing, intensity and colour will be implemented to minimise impacts from lighting. ○ Only add light for specific purposes such as navigational and safety ○ Light only the object or area intended through lighting placement and design (e.g. placement of lights close to the ground, ensuring lights are directed and shielded to avoid light spill). ○ Use the lowest intensity lighting appropriate for the task. ○ Use non-reflective, dark-coloured surfaces. ○ Use lights with reduced or filtered blue, violet and ultra-violet wavelengths. – Odour management measures: ○ Odour generated from waste compactors will be managed through short transfer intervals, which are currently removed on Tuesdays and Thursdays between 11.00 am and 3.00 pm. The remainder of items transported through the new facility are inert with low potential for odour. **Disturbance of UXO** • Surrich (2019) and TAMS Group (2019) undertook a magnetic field survey for UXO to delineate the risks of disturbing UXO. An additional UXO survey, prior to construction works, will be undertaken to further assess anomalies identified during the initial UXO survey • Management targets and actions to minimise potential impacts to social surroundings from the risk of disturbance to UXOs from construction of the proposal are outlined in the CEMP (Appendix P). The management targets include: – Minimise risk of disturbance to UXO site.
	Rehabilitate	• If the resurveyed ferrous debris targets are identified as UXO, appropriate remediation and management will be undertaken. • Construction effects (outside the development envelope) on recreational fishing will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities. • All impacted moorings are proposed for relocation (rather than removal).
	Offset	Social surroundings offsets are not considered applicable to the proposal.
Residual impacts	The permanent relocation of four moorings.	
Environmental outcomes	• No exceedance of Environmental Protection (Noise) Regulations 1997. • No reduction in recreational fishing values outside the development envelope and ZoMI which are attributable to the proposal. • The risk for disturbance to UXO is managed so that there is not a significant risk for injury to people or wildlife, or damage to infrastructure. • No impacts to registered ACH sites, either through direct disturbance or indirect impacts to ACH within South Thomson Bay. • No impacts to amenity values from noise, odour and dust within South Thomson Bay during construction and operation of the proposal which result in a reduction in recreational values.	

1 INTRODUCTION

In 2019, Rottnest Island Authority (RIA) commenced technical investigations to support the proposed South Thomson Barge Landing Development (the proposal) Wadjemup / Rottnest Island. At the end of 2020, the project was paused and no further works were undertaken. RIA has now recommenced the South Thomson Barge Landing Development project.

Ferry berthing and barge operations currently occur at the Main Jetty, at central Thomson Bay, on Wadjemup / Rottnest Island. RIA is proposing to relocate the existing barge operations from the Main Jetty, at central Thomson Bay, to the proposed development envelope located at the existing Army Groyne, South Thomson Bay. This will separate barge operations from public passenger transfer activities and ease congestion at the ferry terminal at the Main Jetty.

Figure 4 provides an overview of the location of the proposed South Thomson Barge Landing Development and the location of the existing barge operations at the ferry terminal at central Thomson Bay.

Figure 4: Regional overview

1.1 Purpose and scope of this document

The purpose of this Environmental Supporting Document is to describe and assess the significance of the environmental impacts to the environmental values associated with the implementation of the proposal. This report provides information on the proposal, local and regional setting, key stakeholders, potential environmental impacts, cumulative impacts and proposed mitigation measures associated with the construction and operation of the proposal.

This document has been prepared to provide a detailed description of the proposal to inform an environmental impact assessment and support the following environmental approvals:

- Referral of the proposal to the Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act) to describe and assess the potential impacts to the EPA's environmental factors

- Referral of the proposal to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to address potential impacts to matters of national environmental significance (MNES).

This supporting document has been prepared to reflect the state framework for environmental impact assessment under the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* and the associated *Procedures Manual (Part IV Divisions 1 and 2)*.

Section 14.2 addresses the potential for the proposal to have a significant impact on federal MNES in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Department of the Environment, 2013).

1.2 Proponent information

Rottnest Island Authority is the proponent for the South Thomson Barge Landing Development, as summarised below.

Name:	Rottnest Island Authority
Postal address:	PO Box 693, Fremantle WA 6959
ABN:	38836160172

The key contact is:

Name:	David Pond
Position:	Environment Compliance and Approvals Coordinator
Phone:	(08) 9432 9300
Email:	david.pond@dbca.wa.gov.au

Further information on the proponent can be sourced from RIA's website: https://www.ria.wa.gov.au/projects-and-developments/significant-projects/marine-logistics-hub.

2 PROPOSAL

2.1 Justification

2.1.1 Key benefits

The key benefits that are anticipated from implementation of the proposal are summarised in Table 12. These benefits are discussed further in Sections 2.1.2.1 to 2.1.2.2.

Table 12: Key benefits from implementation of the proposal

Benefit	Description
Enhanced visitor amenity from a ferry improvement, and barge improvement.	This benefit captures an improvement in visitor satisfaction over time, measured through an increase in visitor willingness to pay for enhanced amenity on the island. Enhanced amenity is achieved through the removal of the barge landing and ferry luggage operations from the Main Jetty to the South Thomson Development, and therefore captures a benefit from both a 'ferry improvement' and a 'barge improvement'.
Avoided future operations and maintenance costs.	This benefit captures the avoided future operations and maintenance costs incurred by RIA due to the requirement to maintain the current Army Groyne to a safe and workable standard.
Avoided safety costs.	This benefit captures the avoided safety costs associated with near-miss and the risk of more serious incidents at the Main Jetty, associated with the conflicted uses of the Main Jetty in its current configuration.
Avoided personal injury and death costs.	This benefit captures the avoided personal injury and death costs associated with inappropriate use of the Army Groyne by visitors to Wadjemup / Rottnest Island, by converting the Army Groyne to an operational area with no public access.
Cost savings from modifying the current barging operation.	This benefit captures the cost savings from the modification of barging operations through the use of more efficient barge sizes, reducing the number of trips required between the island and Perth for a given level of activity at the island.

(ACIL Allen, 2024)

2.1.2 Rottnest Island Management Plan 2023–2028

The *Rottnest Island Authority Act 1987* and Rottnest Island Regulations 1988 require that RIA manage the island in accordance with the Rottnest Island Management Plan 2023–2028 (Rottnest Island Authority, 2023). The Rottnest Island Management Plan 2023–2028 is centred on the following five Strategic Focus Areas (ACIL Allen, 2024):

1. Diversify the visitor base and enhance visitor experience
2. Deliver sustainable infrastructure and services
3. Respect and engage with the island's cultural heritage
4. Explore and conserve the island's heritage
5. Foster strong partnerships.

Under Strategic Focus Areas, RIA has defined a number of Key Initiatives. Key Initiatives that relate directly to the proposal are discussed in Table 13 and Sections 2.1.2.1 to 2.1.2.2.

Table 13: Rottnest Island Management Plan 2023–2028 Strategic Focus Areas

Strategic focus area	Key initiatives	Relevance to proposal
1. Diversify the visitor base and enhance visitor experience	**1.1** Target new visitor segments **1.2** Enhance visitor experience **1.3** Facilitate new accommodation and hospitality developments **1.4** Renew and expand RIA visitor accommodation – Stay Rottnest **1.5** Improve RIA's affordable visitor accommodation – Stay Rottnest **1.6** Realise Kingstown Barracks' vision **1.7** Encourage new recreational offerings **1.8** Upgrade Pedal & Flipper Hire facility **1.9** Improve accessible tourism.	**1.2 Enhance visitor experience** RIA has plans to transition the island's barging operations away from the main jetty to the former Army Groyne in South Thomson Bay. This will help reduce visitor congestion, improve safety and improve the arrival experience.
2. Deliver sustainable infrastructure and services	**2.1** Support renewable energy and electrical infrastructure upgrades **2.2** Support drinking water production, supply, and retention **2.3** Support ablutions and wastewater upgrades **2.4** Assess and upgrade transport infrastructure **2.5** Maintain maritime infrastructure **2.6** Review moorings policies and management **2.7** Review the Facilities, Utilities and Support Services contract **2.8** Improve asset management.	**2.5 Maintain maritime infrastructure** Wadjemup / Rottnest Island is a favourite hotspot for Western Australia's boating and sailing community and caters for commercial and recreational marine vessels visiting the island for day trips or extended visits. RIA is responsible for the construction, management, and operation of the island's maritime structures including a main operating commercial jetty, five recreational jetties, a commercial barge landing ramp, a rock groyne and associated boat ramp and the newly constructed limestone seawall at South Thomson Bay to minimise ongoing erosion of the dune area. RIA has developed a Maritime Infrastructure Asset Management Plan to implement the following projects: 1. Main jetty berth 1–3 refurbishment 2. Barge landing ramp refurbishment 3. Hotel jetty refurbishment 4. Geordie Bay jetty refurbishment 5. Main jetty firefighting facility 6. General maintenance.

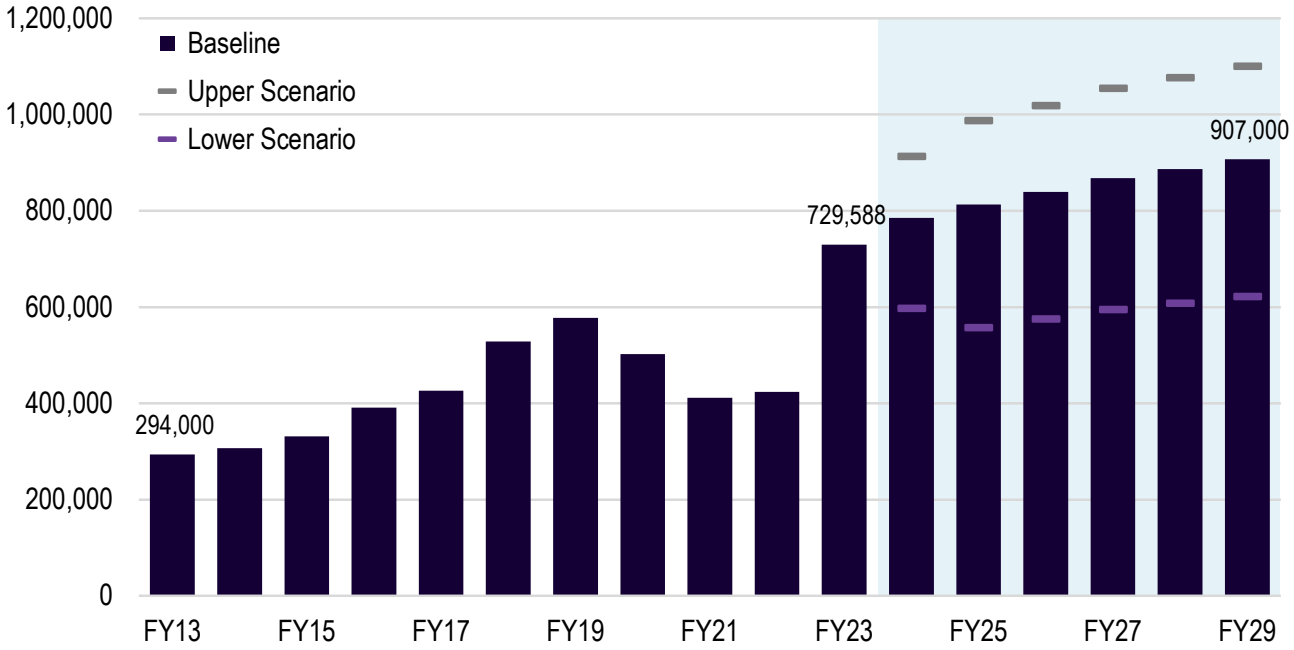
2.1.2.1 Enhancing visitor experience

2.1.2.1.1 Conflicts in use at the Main Jetty

The Main Jetty is the primary marine infrastructure asset on Wadjemup / Rottnest Island, providing both passenger and logistics services. There is an inherent conflict in this approach, as visitors to the island are required to walk past a busy logistics hub. This situation is compounded by the operating structure and contracts associated with the activities that occur on the Main Jetty, as detailed below:

- Movement of Wadjemup / Rottnest Island visitors (including their bicycles) and staff on and off the island by ferry operators including Rottnest Fast Ferries, Rottnest Express and SeaLink
- Movement of island accommodation guest luggage on to and off the island by Programmed Facilities Management
- Operations of the barge landing and logistics services for all island businesses including RIA by Pelagic Marine Services.

An increase in visitation to Wadjemup / Rottnest Island has resulted in increased utilisation of all marine assets, particularly the Main Jetty, which accommodates ferry arrivals and departures. Graph 1 provides the ferry-based visitation to Wadjemup / Rottnest Island under lower and upper scenarios.



Graph 1: Total ferry-based visitation to Wadjemup / Rottnest Island, visitors by financial year, and lower and upper scenario (ACIL Allen, 2024)

A significant increase in RIA's capital works program has also contributed to an increase in activity at the Main Jetty and current barge landing site. Future expenditure on capital works is also expected to contribute to an elevated level of activity at the Main Jetty and current barge landing site over the next three to five years (ACIL Allen, 2024).

Barging operations attributable to third party developments (e.g. The Lodge Wadjemup) have also contributed to congestion during construction activity. As detailed in the Rottnest Island Management Plan, there are a number of potential developments that are expected to result in further increases in congestion at the current barge landing and tourist receival site, including:

- Golf Course Precinct revitalisation and Mount Herschel provision for visitor accommodation
- Staff accommodation along Parker Point Road, north of Kingstown
- New and infill visitor accommodation at South Thomson Bay, North Thomson Bay and Bathurst.

2.1.2.1.2 Safety issues

There are potential risks arising from the interaction of the barge servicing activities (servicing vehicles, which use Henderson Avenue to access the Barge Landing Area) and Wadjemup / Rottnest Island visitors (pedestrians and cyclists). This risk is due to the location of the barge landing area, which is at the base of the Main Jetty, where visitors embark and disembark the ferry. Over 23 safety incidents have been reported between 2017 and 2023 (ACIL Allen, 2024).

It is anticipated that relocating the existing barge operations away from the Main Jetty will reduce the frequency of these safety incidents.

2.1.2.1.3 Inefficiencies associated with the current barging area

The current location of barging operations is constrained and there are limited means by which the existing operating envelope of barging operations can increase without impacting on other uses of the Main Jetty or without incurring higher costs.

An options assessment identified that the current barge landing infrastructure at the Main Jetty does not cater for any growth in vessel size over time. This is due to the depth of the berth pocket at the current barge landing, and the height of the barge ramp relative to the tidal range of the area around the Main Jetty. This eliminates the ability for growth in the demand for in-bound and out-bound logistics to be met by larger barge vessels; growth is instead met by the relatively less efficient method of an increase in the number of barge movements.

The proposal has been designed to allow for larger barge vessels than are currently accommodated at the Main Jetty.

2.1.2.2 Maintain maritime infrastructure

The key outcome in regard to maritime infrastructure, as outlined in the Rottnest Island Management Plan 2023–2028 (Rottnest Island Authority, 2023), is for the island's maritime infrastructure to be maintained to a high standard. RIA is responsible for the construction, management, and operation of the island's maritime structures, including a main operating commercial jetty, five recreational jetties, a commercial barge landing ramp, a rock groyne and associated boat ramp, and the newly constructed limestone seawall at South Thomson Bay (which is mitigating ongoing erosion of the dune area).

Since 2020, three jetties have been reconstructed or replaced, including the fuel jetty (2020), Stark and T jetty (2021), and Main Jetty berths 4/5 (December 2022).

Implementation of the proposal at the existing Army Groyne avoids the requirement for ongoing maintenance of the Army Groyne.

2.1.3 Rottnest Island Land Use Plan

The Rottnest Island Land Use Plan classifies the site as an infrastructure and support services zone, which is compatible with the proposal (Figure 5).

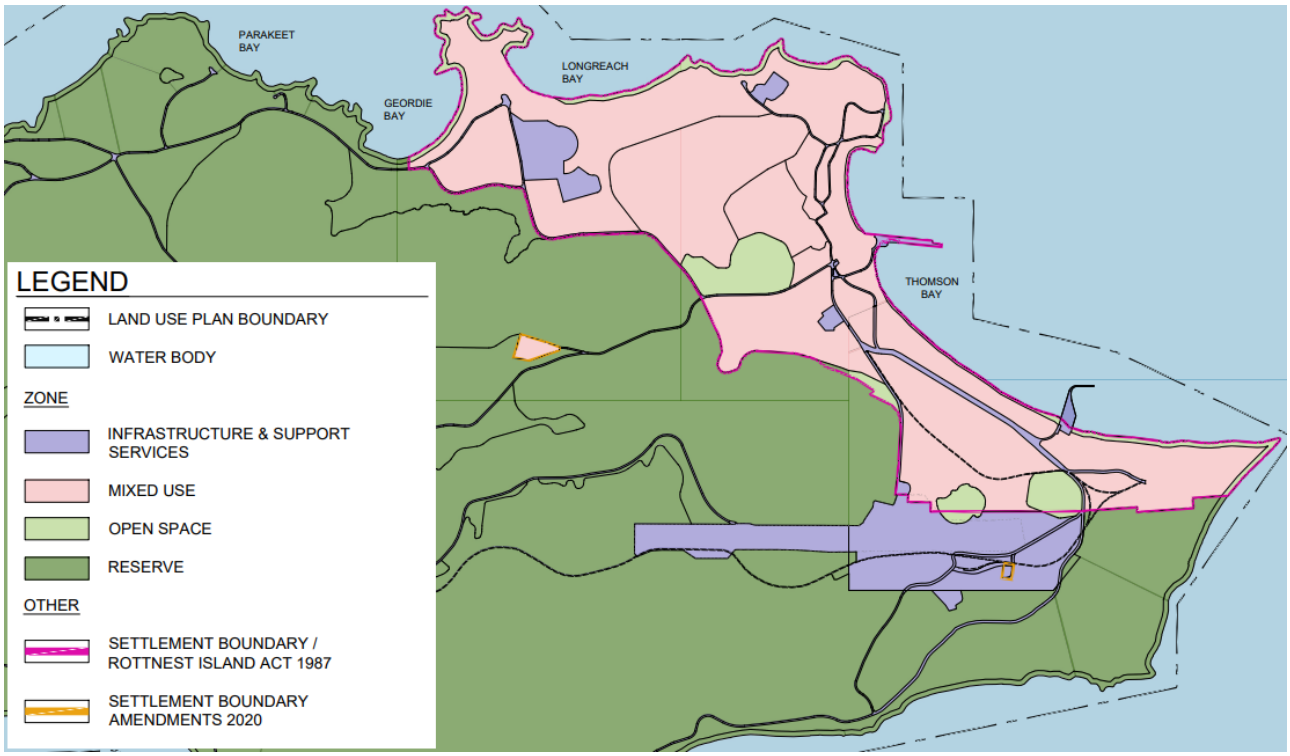


Figure 5: Rottnest Island Land Use Plan (RIA, 2024)

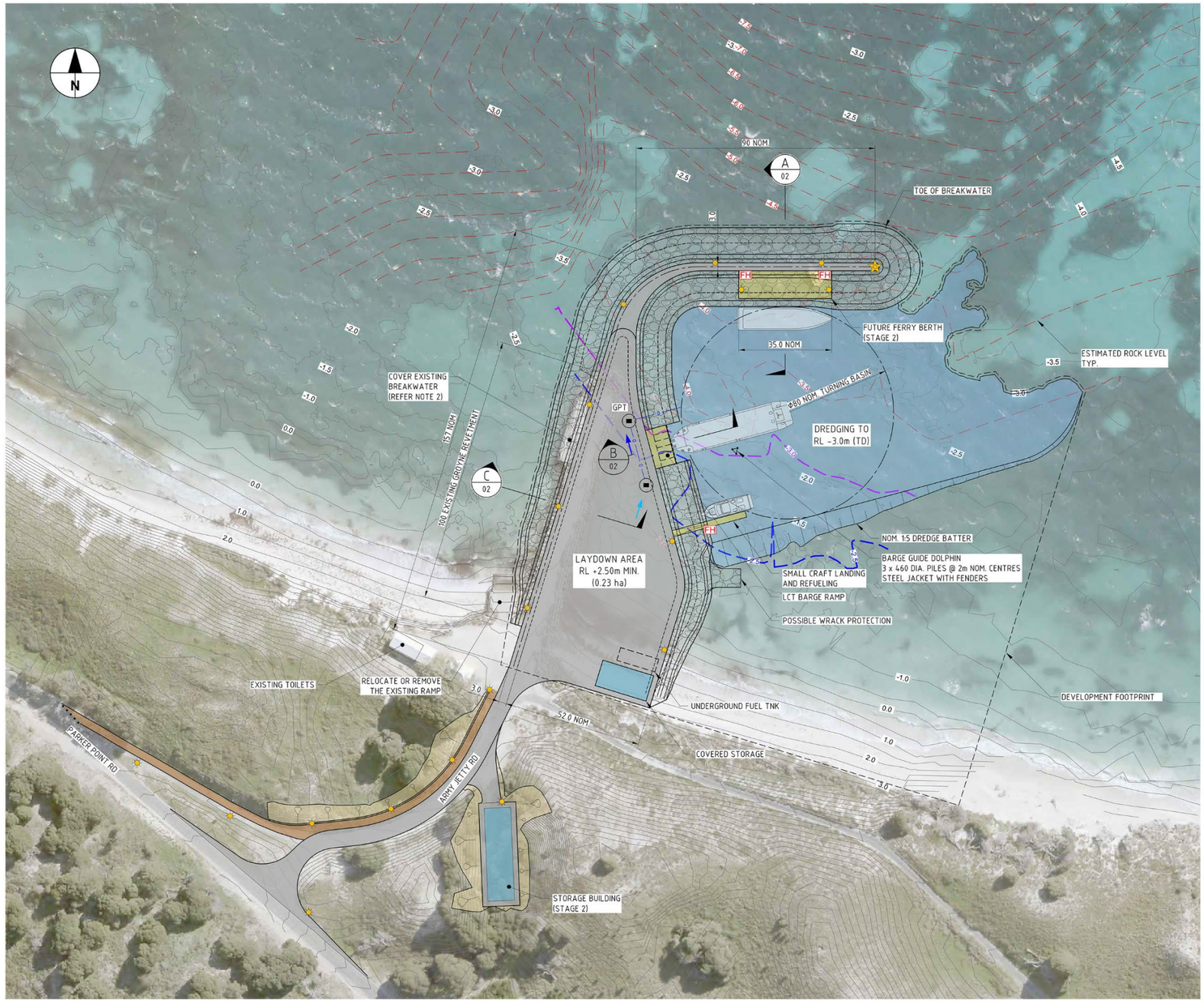
2.2 Proposal description

The South Thomson Barge Landing Development is proposed to be developed at the location of the existing Army Groyne in South Thomson Bay (Figure 4 and Figure 10).

The proposal will be primarily used for barge operations, which will be relocated from the existing ferry terminal at the Main Jetty in central Thomson Bay to the proposed location at the Army Groyne in South Thomson Bay. This will separate barge operations from public passenger transfer activities and ease congestion at the ferry terminal. The proposed development will improve the functionality and efficiency of transporting bulk cargo to and from Wadjemup / Rottnest Island and improve safety and amenities for visitors to the island.

The proposed development will include the following key aspects, as depicted in Figure 6:

- The relocation of critical barging operations from the Main Jetty to the existing Army Groyne (Figure 4)
- Construction of the proposed facility, which will include both onshore and offshore components as summarised below:
  - Extension of the existing Army Groyne
  - Construction of maritime infrastructure including a barge landing ramp, ferry berth and small craft landing facility
  - The establishment of new fuelling facilities as back up vessel refuelling facilities
  - Construction of a storage facility
  - Construction of hardstand and roads.
- Installation of services including water, firefighting, electrical, communications and fuel.



REVN	DATE	AMENDMENT	DRN	DESIGN APPROVAL
C	12/08/20	FINAL ISSUE	DLM	
B	07/08/20	FINAL ISSUE	DLM	
A	20/07/20	FINAL ISSUE	DLM	

ORIG SIZE A1 | ARCHIVE | PROJECT No

NOTES
1. CONSIDER REUSE OF EXISTING ARMOUR ROCK FOR CONSTRUCTION OF DESIGN SECTION
2. RUBBLE MOUND STRUCTURE MAY REQUIRE GEOTEXTILE
3. THE LAYDOWN AREA TO BE ADJUSTED BY RAISING PAVEMENT LEVELTO PRE-CONSTRUCTION SURVEY ENSURING THAT IT HAS SUFFICIENT CAPACITY TO ACCOMMODATE ALL THE DREDGED MATERIAL

AECOM
AECOM Australia Pty Ltd A.B.N. 20 093 846 925

SCALE: 1 : 750
UNLESS OTHERWISE STATED DIMENSIONS IN METRES
DATUM
VERTICAL: ROTTNEST ISLAND SOUNDING DATUM 1978, 3.628m BELOW BM PWD WA, A728. 0.72m BELOW AHD 1980.
HORIZONTAL: MAP GRID OF AUSTRALIA BASED ON GDA94, ZONE 50

ACTION	NAME	DATE
ENGINEER	G.WEARNE	20/07/2020
DRAWN	D.MACLEAN	20/07/2020
ENGINEERING CHECK		
DRAFTING CHECK		
APPROVED PROJECT MGR		

CLIENT: ROTTNEST ISLAND AUTHORITY
PROJECT: SOUTH THOMSON BAY DEVELOPMENT
TITLE: VALUE ENGINEERING CONCEPT 1
GENERAL ARRANGEMENT (STAGE 2)
DRAWING NUMBER RIA-2520-19180-MAR-03 REVN C

Figure 6: Barge Landing design concept

Construction of the above will be undertaken in two stages as described in Table 14 and shown Figure 7 and Figure 8. The proposed construction methods are described in further detail in Appendix A.

All construction activities will be undertaken within the development envelope shown in Figure 9.

Table 14: Description of construction stages

Construction stage	Construction method	Details
Stage 1 (Figure 7)	Preliminary actions	This includes all planning, design and preparation works including plant and equipment and fabrication activities. This will also include verification of the site (seabed survey) as well as any underground service location.
	Mobilisation and site set up	This includes installation of site sheds, preparation of laydown areas, erection of marine traffic management, site signage, public advertisements and mobilisation of equipment.
	Temporary works construction	A temporary roll-on, roll-off (RORO) facility will be constructed to off load equipment and materials. The RORO will be constructed either through localised improvements to the Army Groyne or a bespoke structure and may located on the western side of the Army Groyne. The RORO will be suitable for unloading of large equipment and/or materials such as precast concrete, piles, earthmoving equipment, temporary structures, and also dredge spoil for use in reclamation. The existing small boat landing may be utilised by the contractor during construction for launching small craft.
	Dredging	Dredging must be undertaken across the dredge footprint prior to construction of the wharf and new laydown area. Dredging methodologies are described in Table 17 and Appendix A of this report and summarised below: • An estimated 14,000 m^3 of sand and 2,017 m^3 of rock will be dredged. Once loosened or dislodged, these materials will be raised to the water's surface, to be undertaken mechanically via raising the bucket or grab of a backhoe dredge (BHD). • Excavated material is placed onto a flat-top barge moored alongside the BHD. When the barge is filled to its safe working capacity, it will drive to the RORO facility to be unloaded. • A silt curtain will be placed around the BHD to mitigate the potential environmental impact due to the dredge plume.
	Reclamation	The laydown area shall incorporate reclaimed dredged fill material and shall be constructed as described in Table 17 and Appendix A of this report.
	Extension of the existing Army Groyne	On completion of the reclamation processes, the existing Army Groyne will be upgraded and extended through: • Removal of excess rock and materials and reshaping the existing Army Groyne • Placing core materials, a filter layer (geotextile) and rock armour to shape and extend the existing groyne.
	Maritime infrastructure	Maritime infrastructure constructed in Stage 1 includes the Barge Landing Ramp. The Barge Landing Ramp works include: • Installation of a precast concrete gravity retaining wall below the water level at the dredge level • Installation of the deck slab • Installation of mooring piles using a vibro hammer (a contingency for the use of hammer piling has been allowed in the impact assessment undertaken in this document should the vibro hammer hit refusal. If the vibro hammer hits refusal, hammer piling will be undertaken).
	Services	Underground services will be installed and connected to onshore underground services. Services consist of: • Water • Firefighting services • Electrical services • Communications • Fuel tank. The fuel tank will be installed in the south-east corner of the reclamation zone and will be installed within the compacted dredge spoil. Installation of the fuel tank will be in accordance with all Dangerous Goods regulations (i.e. double lined tank, leak detection systems, tank pit/groundwater monitoring wells).

Construction stage	Construction method	Details
	Storage shed	These works consist of construction of the shed structure and hardstand in the south-east corner of the reclamation zone.
	Road works	Road work construction required to complete any sections of the new facility and the road section linking to the Army Jetty Road.
	Demobilisation	Demobilisation will be undertaken at completion of construction works as outlined in Appendix A.
Stage 2 (Figure 8)	Ferry berth	The ferry berth will be constructed through: • Installation of piles using a vibro hammer. As outlined in Stage 1, a contingency for the use of a hammer pile has been allowed in the construction methodology and impact assessment should the vibro hammer meet refusal • Installation of a precast concrete deck and surface • Fit out of the wharf with fenders, fender chains, mooring bollards, signage, lighting.
	Small craft landing	The Small Craft Landing works include: • Installation of piles using a vibro hammer rig. A contingency for the use of a hammer pile has been allowed in the construction methodology and impact assessment should the vibro hammer meet refusal. • Installation of abutment • Installation of floating deck units • Installation of navigational aids.
	Storage building	Construction of the storage shed structure and hardstand to the east of Army Jetty Road.

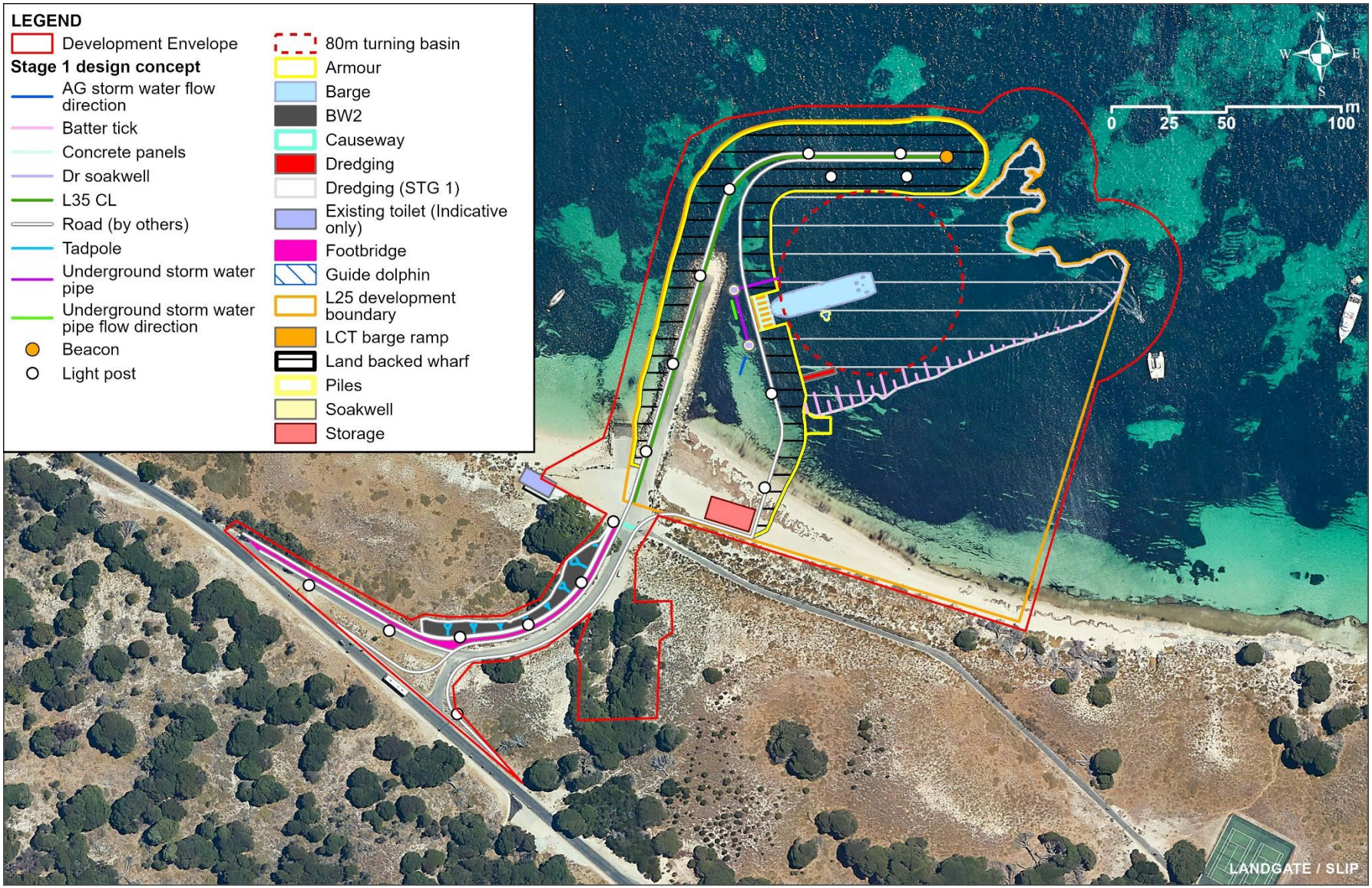


Figure 7: Proposal development plan (Stage 1)

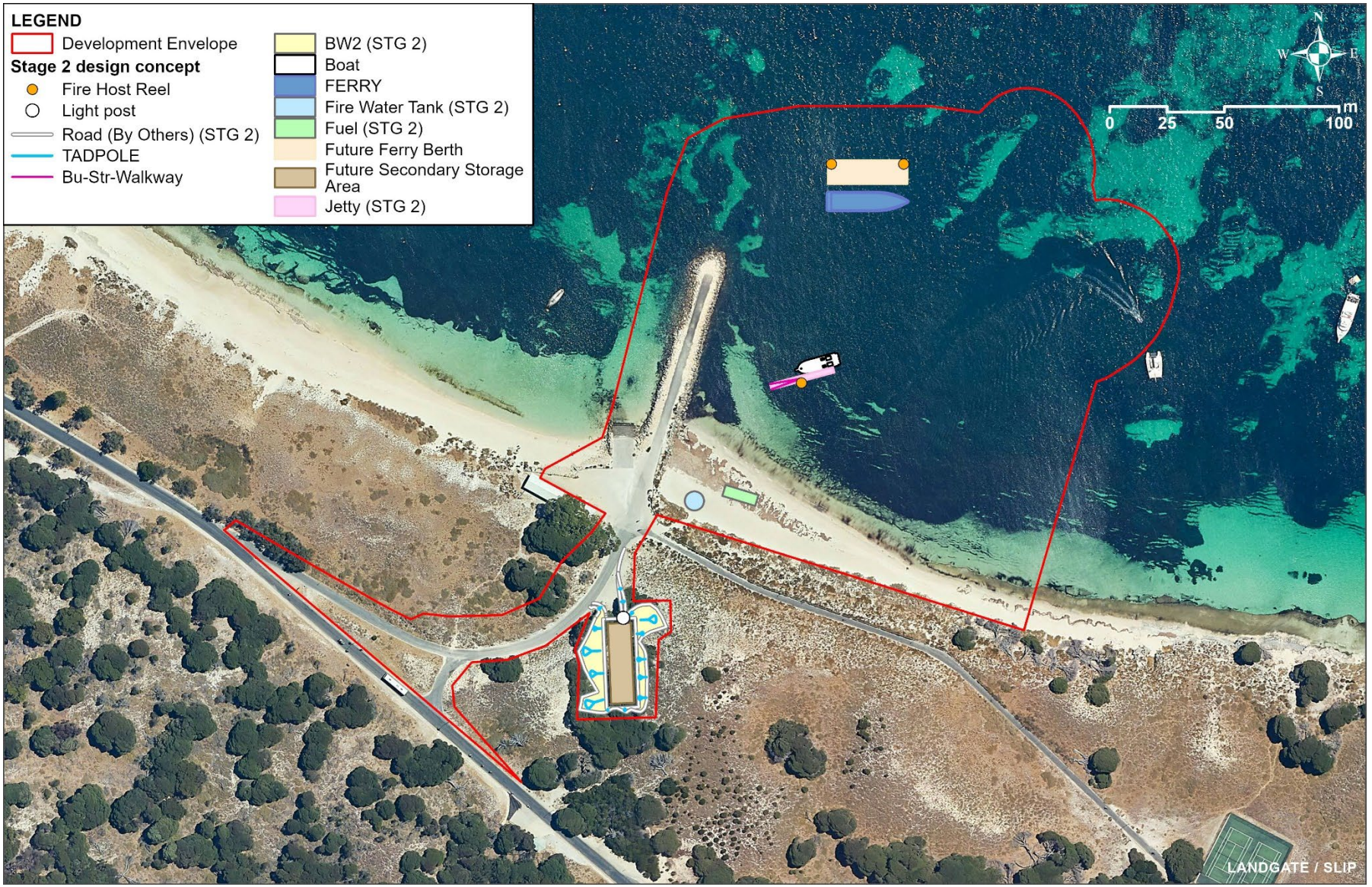


Figure 8: Proposal development plan (Stage 2)

2.2.1 Proposal content

The proposal comprises an onshore component and offshore component (an area of reclamation and an extension of the existing Army Groyne to form the proposed wharf) as summarised below:

- **Indicative disturbance footprint**: The indicative disturbance footprint encompasses the onshore and offshore physical infrastructure associated with proposal and dredge areas (Figure 9).
  - The onshore component comprises approximately 1 hectare (ha).
  - The offshore component comprises a wharf area (extension of the existing Army Groyne) (1.13 ha) and a dredge area (1.02 ha) (Table 17), resulting in a combined indicative disturbance footprint of up to 3.15 ha.
- **Development envelope**: Comprises 4.83 ha and encompasses the indicative disturbance footprint, modelled Zone of High Impact and a buffer area (Figure 9).

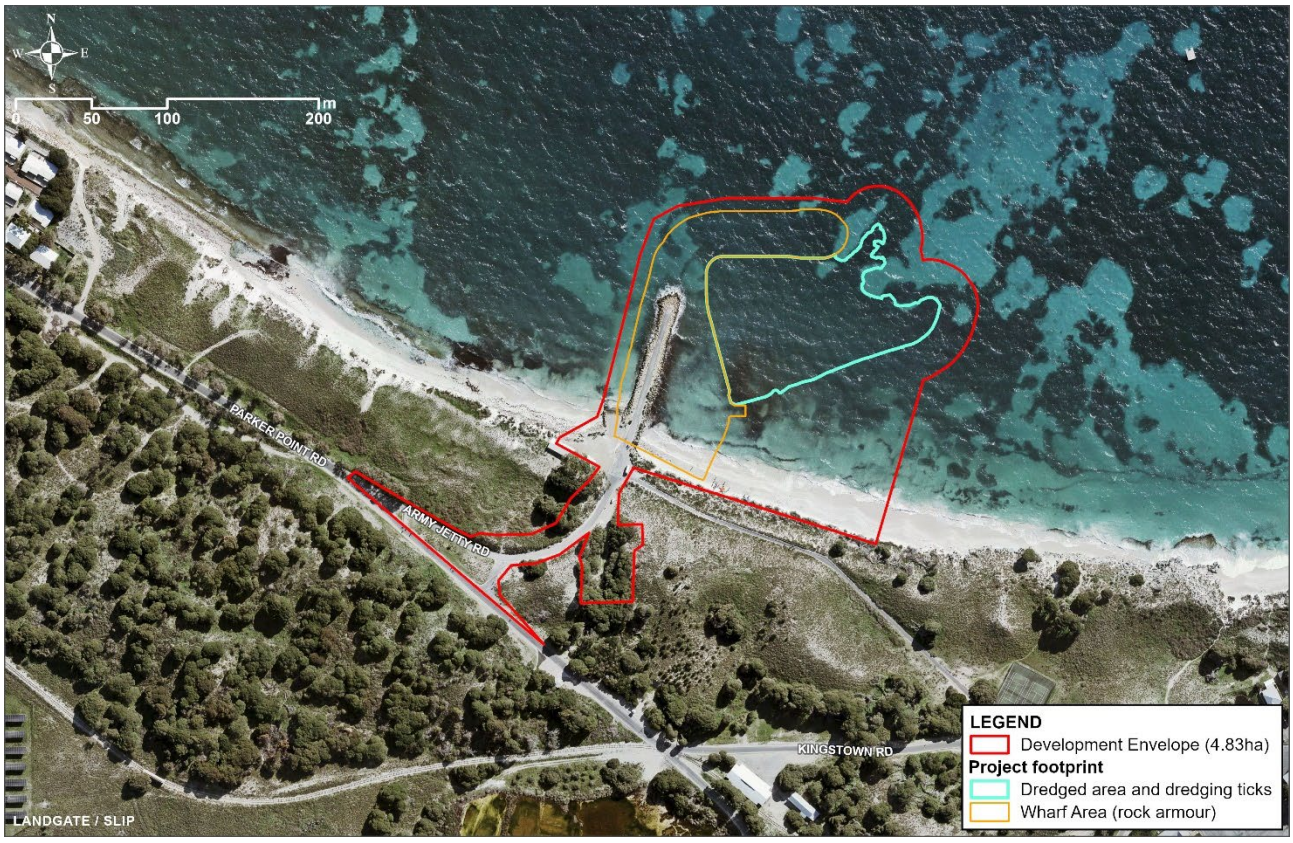


Figure 9: Development envelope

In addition to the development envelope, the environmental impact assessment presented in this report has also included the predicted zone of impact from the proposed dredging activities. A Dredge Plume Modelling Assessment was undertaken by Baird (2024b) that calculated the zones of impact, these are shown in Figure 10 and summarised in Table 15.

Table 15: Predicted zones of impact (Baird, 2025b)

Zone of impact	Definition
Zone of High Impact (ZoHI)	The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.
Zone of Moderate Impact (ZoMI)	The area within which predicted impacts on benthic communities or habitats are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the ZoHI.
Zone of Influence (ZoI)	The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI.

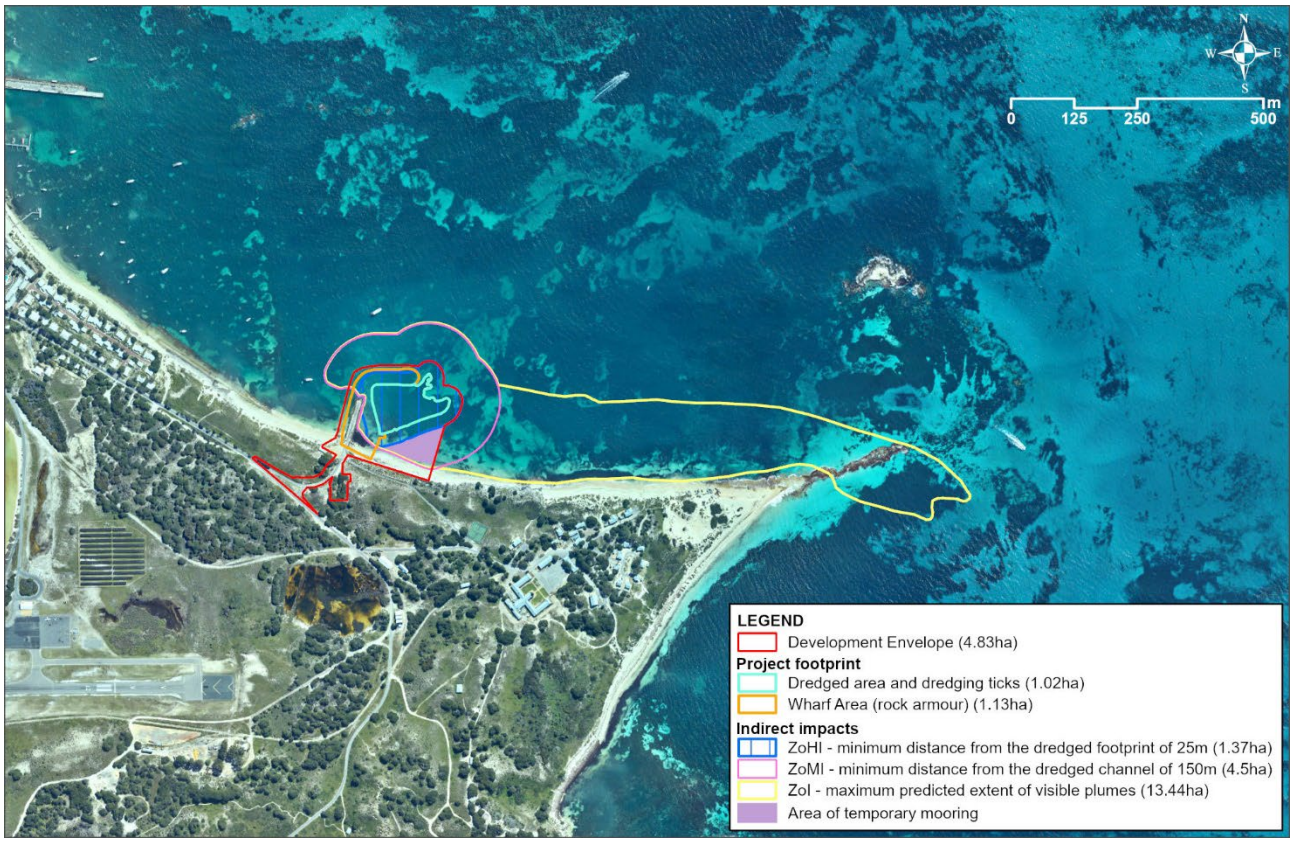


Figure 10: Development envelope and predicted zones of impact

A summary of the proposal is provided in Table 16 and a description and identification of the proposal elements is provided in Table 17.

Table 16: Summary of the proposal

Proposal title	South Thomson Development Barge Landing Project
Proponent name	Rottnest Island Authority
Short description	Rottnest Island Authority is proposing to relocate the island's existing barging operations away from the Main Jetty to the existing Army Groyne in South Thomson Bay. This will help reduce congestion and improve the arrival experience to the island. To support the relocation of the barge operations, Rottnest Island Authority is proposing to extend and redevelop the existing Army Groyne.

Table 17: Description and identification of proposal elements

Proposal element	Location / description	Maximum extent, capacity or range
Physical elements		
Development envelope	Figure 10 Encompasses the indicative disturbance footprint (wharf and dredge area), a buffer area, an area proposed for the mooring of vessels and the dredge Zone of High Impact (ZoHI)).	4.83 ha
Indicative disturbance footprint	Figure 10 The indicative disturbance footprint encompasses the onshore and offshore physical infrastructure associated with proposal and dredge areas.	Total area: 3.15 ha Terrestrial disturbance footprint: 1 ha Wharf and laydown area (marine footprint): 1.13 ha Dredge area (marine footprint): 1.02 ha.
Construction elements		
Dredging	Construction methodologies are provided as Appendix A. Dredging and piling are likely to be undertaken in the winter months of 2026. Dredge plume modelling by Baird (2024b) estimates that dredging may take up to 7.5 weeks to complete. The dredging methodology is summarised below: • Dredging will be undertaken with the use of a Backhoe Dredge (BHD). • The BHD is positioned with a support tug and then using its spud piles and excavator arm it manoeuvres into the required dredging location. • The loosening or cutting process breaks the in-situ materials' cohesion, allowing these materials to be removed. The process will be carried out mechanically using the cutting edge of a bucket on a BHD. Once loosened or dislodged, these materials will be raised to the water's surface mechanically via raising the bucket or grab of a BHD. • Excavated material is placed onto a flat-top barge moored alongside the BHD. When the barge is filled to its safe working capacity, it will drive to the RORO facility to be unloaded. • A silt curtain around BHD will be installed to mitigate the potential environmental impact from the dredge plume. • The dredged material will be reused as fill material in the laydown/hardstand and reclamation area.	The proposed dredge area is shown in Figure 10 and comprises 1.02 ha. Dredging will be undertaken to a declared depth of – 3.0 m Chart Datum, which will include a turning basin with a nominal diameter of 80 m. An estimated 14,000 m^3 of sand and 2,017 m^3 of rock will be dredged.
Reclamation	Construction methodologies are provided as Appendix A. The reclamation methodology depicted in Figure 11 is summarised below: • Existing armour from the eastern side of the Army Groyne will be removed and used for construction of bunding. Bunding will be constructed along the eastern and northern sides of the reclamation zone to allow dredge spoil to settle and remain in place. This bunding will prevent dredge spoil from being washed away into the marine environment. Figure 11 provides an indication of the bund wall location. • The bunding will be constructed using core materials, followed by a geotextile filter layer and an armour layer. Figure 12 provides a conceptual cross-section of the bunding, reclamation fill and then adjacent dredge zone. • As reclamation progresses, the bunding on the marine side of the reclamation zone will need to be progressively moved to the north to ensure that each successive round of dredge spoil placed will remain in place. • Using the dredged spoil, the contractor will establish a tip head to place the dredged material into the water in the south-west corner of the reclamation area. Dredge spoil will be placed and spread in a north and east direction. • Material will be tipped from the articulated dump truck and pushed out over the tip head using a wheel loader or similar. • Material will be compacted using a static pad foot roller. • Reclamation will continue until all dredge spoil has been placed. AECOM (2020) and PAEMAC (2024) estimated that the dredge spoil will be sufficient to complete the laydown area. There is not expected to be a requirement to import fill to complete the laydown area.	The proposed reclamation area is shown in Figure 10.
Construction of the wharf	Construction methodologies are provided as Appendix A. On completion of the reclamation works summarised above, the wharf will be constructed through extending the existing Army Groyne with rock armour as outlined below: • Remove excess rock and materials and reshape the existing Army Groyne. • Import all rock and core materials from the mainland using a conventional barge converted for handling rock. • Place core materials along exposed batter. • Place filter layer (geotextile). • Place class 2 rock armour along exposed batter and class 1 rock armour along the northern breakwater. The proposed rock armour classes are shown in Figure 13. • Place a layer of crushed rock basecourse and asphalt along the Army Groyne extension to match that placed in the reclamation area.	The proposed wharf area is shown in Figure 10.
Piling	• The barge landing ramp works will include Installation of mooring piles to a maximum depth of 10 m using a vibro hammer. • Construction of the ferry berth will require installation of piles using a vibro hammer rig operated from a barge located adjacent. The dimensions and number of piles is estimated at 16 × 610 mm that will be installed to a depth of 15 m. If the contractor does not install piles concurrently with construction of the breakwater, then 1200 mm sleeves will need to be installed in the rock armour so piles can be driven through the sleeves. • Construction of the small craft landing facility will include installation of piles using a vibro hammer rig operated from a barge located adjacent. The dimensions and number of piles is estimated at 6 × 500 mm that will be installed to a depth of 10 m. If the contractor does not install piles concurrently with construction of the breakwater, then 1200 mm sleeves will need to be installed in the rock armour so piles can be driven through the sleeves. As discussed in Table 14, all piling proposed will be undertaken using a vibro hammer. However, a contingency of using a hammer pile has been adopted should the vibro hammer meet refusal. Both the proposed piling method (vibro hammer) and contingency method (hammer piling) have been included in the impact assessment.	Piling locations will be determined during detailed engineering design.
Other marine infrastructure and services	Hardstand and a shed structure will be constructed within the onshore component of the development envelope. Services will be installed conventionally using a combination of on island and imported small plant. Services consist of water, fire service, power, CCTV and fuel provisions.	All works will occur within the development envelope shown in Figure 10.
Operational elements		
Vessel movements	The proposed facility shall allow barge berthing, unloading and loading and departure for all conditions permitting safe transit across to Wadjemup / Rottnest Island. Typically barge and ferry operations are suspended when wind speed (ten-minute average) exceeds 40kn and/or Hs >4 m for waters inshore of Wadjemup / Rottnest Island. The existing barge schedule, as per Pelagic Marine Services operations, is provided below. There may be exemptions to these times to accommodate for special deliveries.	N/A

Current barge activity	Time
Gates open (20 Rous Head Road, North Fremantle)	5:30 am
Same day perishable deliveries	6:15 am
Scheduled vessel departure	6:45 am
Scheduled arrival – Thomson Bay	8:30 am
Last time for arrival of vehicles and returning goods at the Thomson Bay wharf	10:30 am
Departure (Thomson Bay, depending on volumes, returning freight)	12:00 am to 1.00 pm
Gates close (16 Mews Road, Fremantle)	4:00 pm

Proposal element	Location / description	Maximum extent, capacity or range
Ongoing maintenance	There may be requirements for maintenance dredging during operations. An estimate of the average sediment volume above the mean sea level (that which can be easily managed by land-based dredging methods) that is moving to the area between the transects on the east side of the groyne from winter to the summer peak is 800m^3. Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	This will be undertaken as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.
Other elements which affect extent of effects on the environment		
Proposal time	Maximum project life	Design life shall be 50 years in accordance with AS4997-2005 Normal commercial structure.
	Construction phase	Construction is proposed to be undertaken between 2026 and 2027.
	Operations phase	50 years.

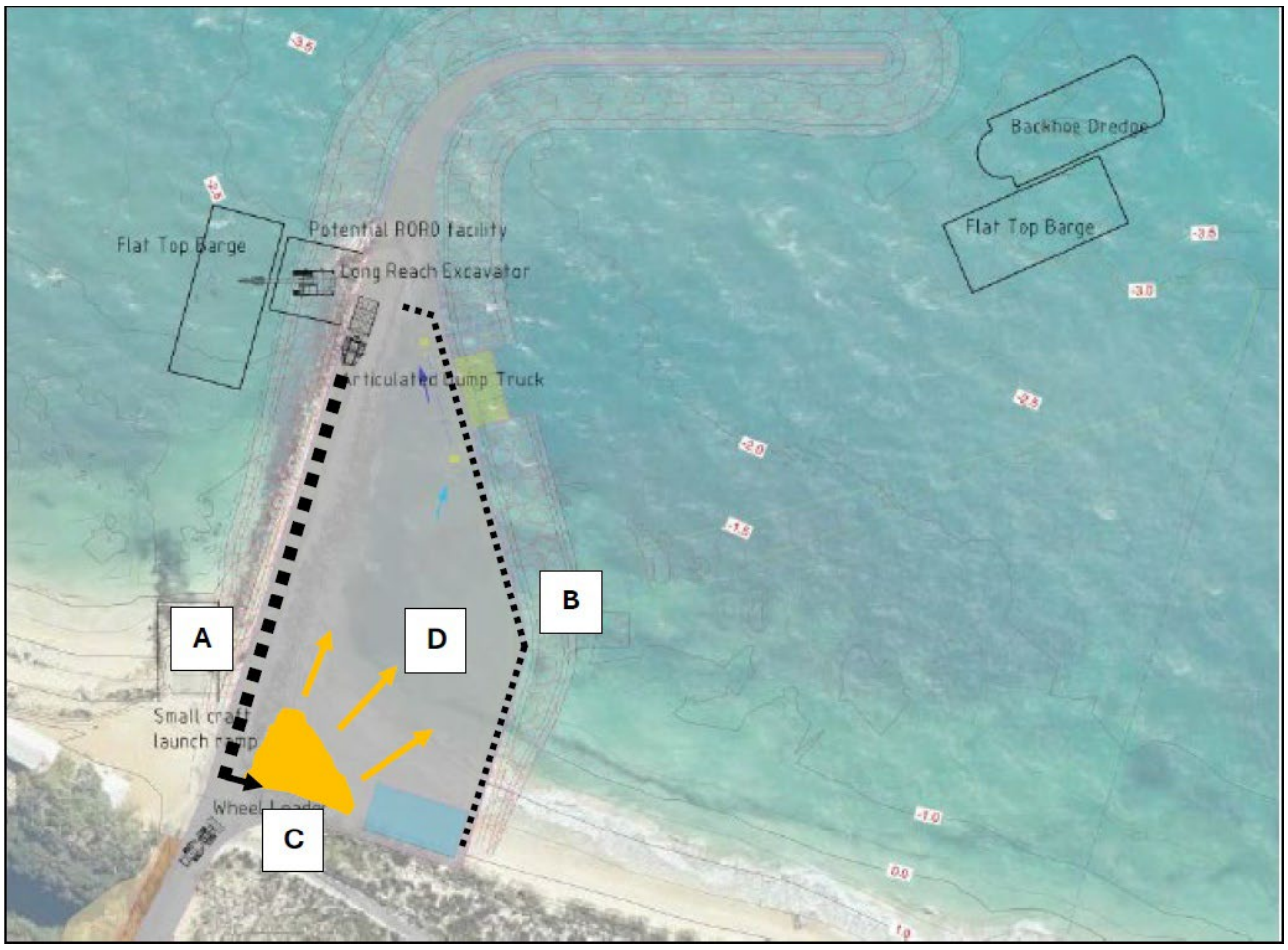


Figure 11: Indicative process for reclamation showing the Army Groyne (A), bund wall (B), placement of dredge spoil in the south-west corner of the area (C) and direction dredge spoil will be placed and spread (D) (PAEMAC, 2024)

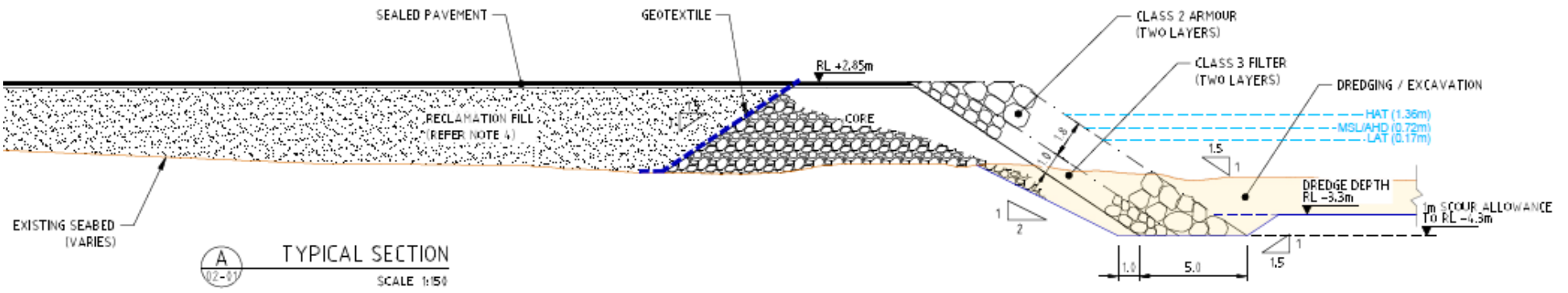


Figure 12: Conceptual cross-section of the reclamation fill, bunding and adjacent dredge zone

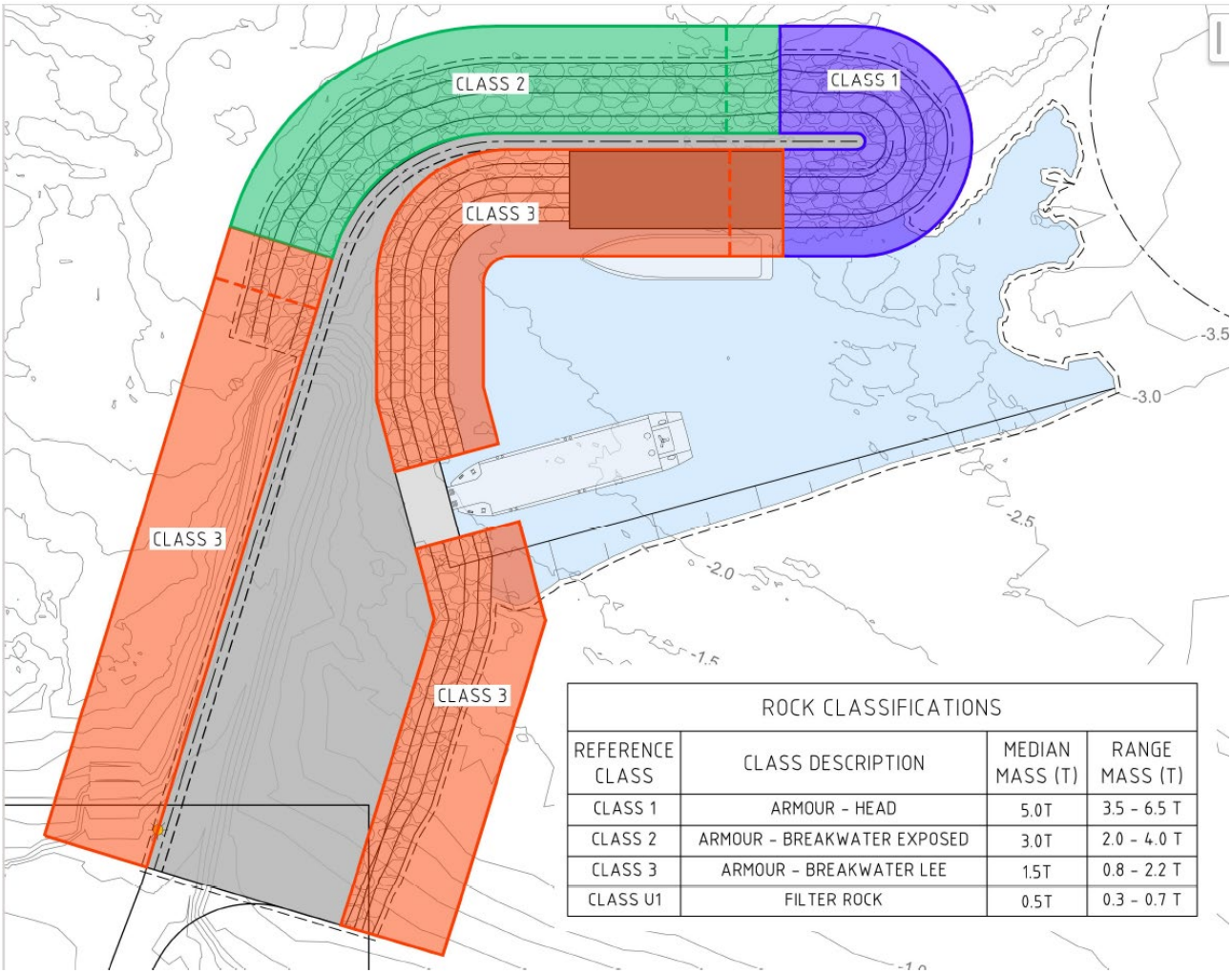


Figure 13: Rock armour classes proposed for construction of the wharf (AECOM, 2020)

2.3 Proposal alternatives

No acceptable alternatives to the proposal have been identified as discussed in Sections 2.3.1 to 2.3.3.

2.3.1 Not implementing the proposal

The current barge landing infrastructure at the Main Jetty does not cater for any growth in vessel size or movements over time. This is due to the depth of the berth pocket at the barge landing, and the height of the barge ramp relative to the tidal range of the area around the Main Jetty. This eliminates the ability for growth in the demand for in-bound and out-bound logistics to be met by larger barge vessels; growth is instead met by the relatively less efficient method of an increase in the number of barge movements. Due to the anticipated growth in visitors to the island, not upgrading the barge facilities is not an option.

The structural integrity of the Army Groyne in its current form is at risk in the event of a severe storm and it is likely that the Army Groyne would incur a level of damage that would require significant repair, or demolition. In addition to the potential repair costs from storm damage, the Army Groyne requires an existing level of operational maintenance. In 2022–2023, RIA incurred around $50,000 in maintenance expenditure and have budgeted these costs at around $60,000 per annum for the foreseeable future. Longer term, however, it is expected that the structural integrity of the groyne will be unable to be maintained and RIA will have to demolish the structure, which would result in a large one-off expense.

Redeveloping the Army Groyne and relocating the current barge operations provides a solution to both of the above issues.

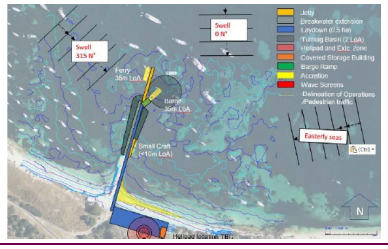
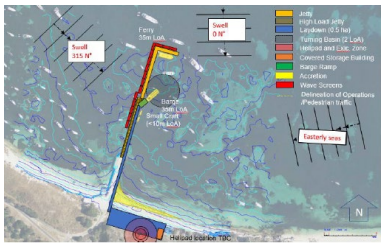
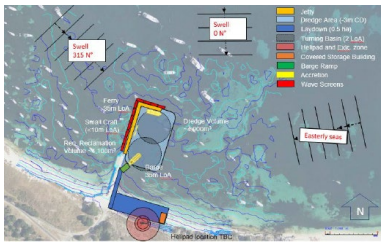
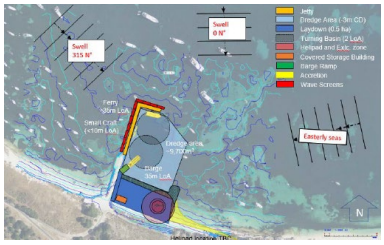
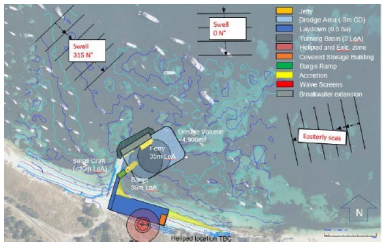
2.3.2 Alternative locations

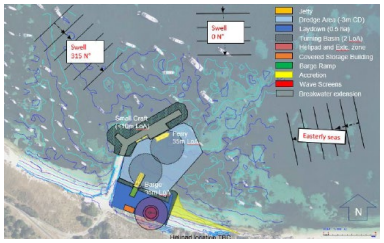
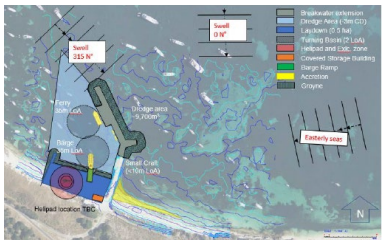
There is limited coastline available within Thomson Bay to construct a new barge landing and it was considered that implementing the proposal at a greenfield site would result in an increased risk of environmental impacts, when compared to the proposed already disturbed location. As such, the current Army Groyne location, which include an already disturbed area was considered the best location.

2.3.3 Options analysis

A number of different design options were considered during the project development phase. Overall, the assessment did not identify a clear preferred option and a design which combined the attributes of Option 3, Option 4 and Option 5 was adopted. This design has since been refined through value engineering design by AECOM and PAEMAC in 2020.

Table 18: Options assessment

Option	Concept design	Key strengths	Key weaknesses
Option 1: Extension of the existing Groyne with no dredging		• No dredging • Allows for staged development.	• Low operability • High effect on coastal processes • Separation of barge and laydown areas • Impact on moorings.
Option 2: Jetty with wave protection and no dredging		• No dredging • Lower operating costs • Limited impact on coastal processes.	• Low operability • High capital cost • Challenging, complex construction method • Impact on moorings.
Option 3: Jetty with wave protection and minimised dredging		• Low capital expenditure • Low operating costs • Limited impact on coastal processes.	• Requirement for maintenance dredging • Separation of barge and laydown areas • Impact on moorings.
Option 4: Jetty with wave protection and dredging		• Low capital expenditure • Low site footprint • Low impact on coastal processes.	• Moderate operating costs • Requirement for maintenance dredging • Moderate operability.
Option 5: Small groyne extension and minimised dredging		• High operability • Lower capital expenditure • Low site footprint.	• High operating costs • Separation of barge and laydown areas • Impact on coastal processes.

Option	Concept design	Key strengths	Key weaknesses
Option 6: Breakwater and dredging		• High operability • Higher serviceability • Reduced landside environmental impacts.	• Impact on coastal processes • Capital and maintenance dredging required • High capital expenditure • Large site footprint.
Option 7: Western-facing facility		• Low capital expenditure • Low impact on coastal processes • Low site footprint • Reduced landside impacts.	• Dredging required • High operating costs • Impact on moorings • Replacement of Wadjemup / Rottnest Island boat ramp (to west of existing groyne).

Source: (ACIL Allen, 2024)

2.4 Local and regional context

2.4.1 Site history

The following site history has been sourced from *Maritime Archaeological Assessment of the Army Groyne Thomson Bay, Rottnest Island* (Department of Maritime Archaeology, Western Australian Museum, 2012).

The Thomson Bay South Development project covers the former the Army Groyne, an integral part of the island's military and recreational heritage. The original Army Groyne was built in 1906 and was used as a terminal for passengers arriving and departing the island, then referred to as the 'excursionist jetty'. The jetty was constructed to allow for horse-drawn trams to take passengers into Thomson Bay settlement and was the first public jetty on the island.

Plate 1: ***Zephyr*** **ported at the 'excursionist jetty', 1924 (RIA 2012.239)**

Plate 2: **'Excursionist jetty', 1930 (RIA 2012.96)**

From 1914 to 1915, during World War I (WWI), the island was run by the military and all tourist activities ceased. The jetty, henceforth dubbed the 'Army Jetty', was used to unload troops and supplies and for prisoner transport to shore as the island was utilised as a Prisoner of War Camp. Following WWI the island was reopened to the public and the jetty returned to its original use.

During World War II (WWII), areas of the island were once again utilised for military activities. The island was developed as the primary defence for Fremantle and Perth by 1937, with works including the reinforcing and extension of the Army Jetty and a gantry being constructed just off the south end of the jetty. Between 1924 and 1945 the island was only used as a military base, with all recreational use ceased. The Army Jetty provided troop and provision movements to and from the island. In 1942 the jetty was further extended to allow for larger vessel access.

Plate 3: **Original timber jetty with gantry on the right, facing west (RIA 2012.265)**

Plate 4: **Original timber jetty facing west to shore (National Archives Australia (NAA))**

The end of WWII in 1945 returned the jetty to its primary tourist use until 1961, when the main jetty was built closer to the settlement. In 1969 the Army inspected the jetty and observed the jetty to be in poor condition, with vehicle access being banned. In 1970, plans were in place to demolish the original structure and reconstruct the jetty with rock fill and compacted limestone base, inclusive of a barge hardstand ramp. In 1972 the demolition and reconstruction had occurred. In 1984 all Army land holdings and buildings were bought back by the state government and the jetty remained for recreational uses such as snorkelling and fishing, however no boats were to dock along the jetty platform due to its fragility.

Plate 5: **Reconstruction works, 1971 (NAA)**

Plate 6: **Reconstruction works, rockfill and barge hardstand (NAA)**

It was observed in National Archives of Australia (NAA) and the State Library of Western Australia literature that much of the old materials were buried beneath the subsequent extensions of the rock fill. The structure was inspected by the Western Australia Maritime in 2012 and the jetty was measured at 120 m length and 1,700 m^2 in area. In October 2018, the jetty underwent platform removal and conversion into a rock groyne as a result of a partial collapse.

2.4.2 Historical photography

A review of online historic aerial photography held by Landgate was undertaken that yielded limited aerials of the site dating back to 1955. The historic development activities of the site and surrounds are summarised in Table 19.

Table 19: Historic photography summary

Year	Site and surrounding area	Historical aerial
1941	Site: The site is already developed with the former Army Jetty. Multiple tracks and trails are identified surrounding the site. South-east: Kingstown Barracks. South: Bickley Swamp. West: Rottnest Island Lakes.	
1955	Site: The site is already developed with the former Army Jetty. Multiple tracks and trails are identified surrounding the site. South-east: Kingstown Barracks. South: Bickley Swamp and Rottnest Island aerodrome. West: Rottnest Island Lakes and the main settlement and tourist hub.	
2000	Site: The site is already developed with the former Army Jetty. Minor infrastructure appears to be located immediately south of the jetty. Multiple tracks and trails are identified surrounding the site. Moorings are located within the marine environment to the north. South-east: Kingstown Barracks. South: Bickley Swamp and Rottnest Island aerodrome. West: Rottnest Island Lakes and the main settlement and tourist hub. Surrounding marine environment: The presence of moorings.	

Year	Site and surrounding area	Historical aerial
2002	Site: Infrastructure has been constructed adjacent to the south-west of the jetty, identified as public toilets and an undercover seating area. Surrounding marine environment: The presence of moorings.	
2004	Site: The minor infrastructure to the south has been removed. Surrounding marine environment: The presence of moorings.	
2017	West: The presence of a solar farm is observed 400 m from the site. Surrounding marine environment: The presence of moorings.	

3 LEGISLATIVE CONTEXT

3.1 South Thomson Bay Barge environmental assessment process

This Environmental Supporting Document has been prepared to support both the state and federal environmental approvals required to implement the proposed South Thomson Bay Barge Development as outlined in Table 20.

Table 20: Environmental assessment process summary

Relevant legislation		Addressed in this report
State	Refer to Section 3.2	The environmental impact assessment process under state legislation is outlined in Sections 7 to 13.
Federal	Refer to Section 3.3	The environmental impact assessment process under federal legislation is outlined in Section 14.2.

3.2 Environmental impact assessment process – state legislation

3.2.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment. The EP Act is administered by the EPA and the Minister for the Environment.

3.2.1.1 Part IV of the *Environmental Protection Act 1986*

The environmental impact assessment process is regulated under Part IV of the EP Act, with Divisions 1 and 2 dealing with proposals and Divisions 3 and 4 dealing with planning schemes. The EP Act sets out the essential requirements of environmental impact assessment, while the specific practices of environmental impact assessment are covered in the Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures (2021) (the Administrative Procedures) (EPA, 2021c).

The Administrative Procedures provide the overarching framework for the EPA to undertake environmental impact assessment. The Administrative Procedures are grouped according to the following key stages:

- Stage 1: Referral of a proposal to the EPA
- Stage 2: EPA to decide whether or not to assess a referred proposal
- Stage 3: Assessment of proposals
- Stage 4: EPA report on the assessment of proposal
- Stage 5: Deciding if proposal may be implemented and implementation of proposals.

The referral of this supporting document and accompanying Section 38 referral form to the EPA under Section 38 of the EP Act allows for the EPA to determine if the referral is valid under the EPA's Administrative Procedures and decide whether or not to assess the proposal.

If the EPA decide not to assess the proposal, any clearing of native vegetation and seagrass required for construction of the proposal will need a permit under Part V Division 2 of the EP Act except where:

- An exemption applies under Schedule 6 of the EP Act; or
- Is prescribed by regulation in the Environmental Protection (Clearing of Native Vegetation) Regulation 2004 and the proposed clearing area is not mapped as an Environmentally Sensitive Area (ESA); or
- Department of Water and Environmental Regulation (DWER) determines that a permit is not required because the proposed clearing satisfies all the referral criteria.

3.2.1.2 EPA guidance and technical reports

The proposal is subject to compliance with applicable guidelines and technical reports that have been developed to assist proponents and the general public, in understanding the minimum requirements for the protection of the environment that the EPA expects to be met during the assessment process.

Table 21 details the EPA's environmental factors and technical guidelines relevant to the proposal.

Table 21: Applicable EPA guidance and technical reports

EPA environmental factor guidelines
Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016f)
Environmental Factor Guideline: Coastal Processes (EPA, 2016i)
Environmental Factor Guideline: Marine Environmental Quality (EPA, 2016e)
Environmental Factor Guideline: Marine Fauna (EPA, 2016j)
Environmental Factor Guideline: Flora and Vegetation (EPA, 2016a)
Environmental Factor Guideline: Terrestrial Environmental Quality (EPA, 2016c)
Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016d)
Environmental Factor Guideline: Inland Waters (EPA, 2018a)
Environmental Factor Guideline: Social Surroundings (EPA, 2023)
EPA technical guidance
Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b)
Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)
Technical Guidance - Protecting the Quality of Western Australia's Marine Environment (EPA, 2016g)
Technical Guidance - Protection of Benthic Communities and Habitats (EPA, 2016f)
Technical guidance - Environmental Impact Assessment of Marine Dredging Proposals (EPA, 2021a)

3.3 Other state approvals and regulations

The proposal is required to comply with the requirements of other relevant state legislation, regulation and policy. Table 22 provides an overview of other potential key state-based approval requirements relevant to the proposal.

Table 22: Other approval requirements

Proposal activities	Type of approval	Legislation regulating the activity	Approval agency
Potential impacts to Aboriginal heritage during vegetation clearing, construction and dredging activities.	There are different types of approval under the *Aboriginal Heritage Act 1972* and in the Aboriginal Heritage Regulations 1974. Approval may be required from either the Minister for Aboriginal Affairs or the Registrar of Aboriginal Sites for any activity which may harm an Aboriginal site. There are four types of authorisations: • Section 18 consent – for more significant impacts and harm to Aboriginal sites • Section 16 authorisation – for excavation purposes (generally related to research) • Regulation 7 approval – to bring plant and equipment to an Aboriginal site • Regulation 10 consent – for more minor activities and impacts. If impact to an Aboriginal site is proposed, the proponent will, in consultation with traditional owners, determine the appropriate approvals pathway under the *Aboriginal Heritage Act 1972.* This process will meet the EPA's objective for Social Surroundings by protecting Aboriginal sites from significant harm.	*Aboriginal Heritage Act 1972* Aboriginal Heritage Regulations 1974	Department of Planning, Lands and Heritage

Proposal activities	Type of approval	Legislation regulating the activity	Approval agency
Storage and handling of hazardous materials may be required during / after construction.	A Dangerous Goods Licence sets standards for the way in which dangerous goods are stored on-site. These standards are aimed at ensuring dangerous goods are stored safely and in such a way that will not result in impacts to the environment.	*Dangerous Goods Safety Act 2004*	Department of Energy, Mines, Industry Regulation and Safety
Activities undertaken by RIA on Wadjemup / Rottnest Island.	Any activities undertaken will be in accordance with this environmental approval and the *Rottnest Island Authority Act 1987*.	*Rottnest Island Authority Act 1987*	RIA

3.4 Environmental impact assessment process – federal legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance (MNES) and is administered by the Commonwealth Minister of the Environment. If an action is likely to have a significant impact on any MNES a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCEEW) is required. MNES are defined as:

- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Ramsar wetlands of international importance
- The Commonwealth marine environment
- World Heritage properties
- The Great Barrier Reef Marine Park
- National heritage places
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

A summary of MNES relevant to the proposed is provided in Table 23.

Table 23: Matters of national environmental significance

EPBC matter	Matters returned	Description	Relevant to the proposal
World heritage properties	None	There are no world heritage properties located within or near the site.	N/A
National heritage places	None	There are no national heritage properties within or near the site.	N/A
Wetlands of international significance	None	There are no wetlands of international significance within or near the site.	N/A
Great Barrier Reef Marine Park (GBRMP)	None	Not relevant to the proposed action as the GBRMP is located off the east coast of Australia.	N/A
Commonwealth marine area	None	The proposed action is not located within a Commonwealth marine area. The Commonwealth marine area is mapped over 7 km from the development envelope and the proposal is not considered likely to impact a Commonwealth marine area.	N/A
Listed threatened ecological communities (TEC)	One	The Protected Matters Search Tool (PMST) search identified the Banksia Woodlands of the Swan Coastal Plain ecological community within the search radius. This ecological community is only recorded from the Western Australian mainland and vegetation present on Wadjemup / Rottnest Island is not associated with this TEC. This TEC is not relevant to the proposal and is not discussed further.	N/A

EPBC matter	Matters returned	Description	Relevant to the proposal
Listed threatened species	44	Birds – 23 Fish – 1 Mammals – 4 Plants – 1 Reptiles – 4 Sharks – 5 Insect - 1	Yes Discussed in Section 14.2
Listed migratory species	102	Migratory Marine Birds – 19 Migratory Marine Species – 17 Migratory Terrestrial Species – 1 Migratory Wetlands Species – 29	Yes Discussed in Section 14.2
Nuclear actions	None	The proposal does not relate to this MNES.	N/A
Water resources in relation to coal seam gas and large coal mining development	None	The proposal does not relate to this MNES.	N/A

Green – MNES not applicable to the proposal.

Orange – MNES considered relevant to the proposal and addressed in this report.

3.4.2 EPBC Act assessment context

3.4.2.1 Accredited assessment

The intention to develop a bilateral agreement with Western Australia under Section 45 of the EP Act and EPBC Act was published in 2019. The draft bilateral agreement is intended to revoke and replace the current bilateral agreement (2014) between the Commonwealth of Australia and the State of Western Australia. Until the agreement is amended, the assessment of any new proposals that would otherwise have been assessed by the EPA under the agreement will be individually accredited by the Commonwealth Government. If significant impacts to a MNES are identified because of the proposal, a separate EPBC Act referral will be submitted to the Commonwealth DCCEEW to 'turn on' the accredited assessment process.

The environmental impact assessment of MNES is outlined in Section 14.2.

4 STAKEHOLDER ENGAGEMENT

4.1 Key stakeholders

RIA understands and acknowledges that any changes to the infrastructure on Wadjemup / Rottnest Island is of interest to the community. Engagement regarding the project commenced in 2019.

Key stakeholders for the proposal are summarised below:

- State government agencies and regulators
  - Department of Biodiversity, Conservation and Attractions (DBCA)
  - Department of Water and Environmental Regulation (DWER)
  - Department of Planning, Lands and Heritage (DPLH)
  - Department of Transport (DoT)
- Traditional owners
- Local community, local businesses and non-government organisations (NGOs).

4.2 Stakeholder engagement process

Consultation has occurred with the key stakeholders listed in Section 4.1. RIA has sought to engage on major issues through in-person briefings where possible, with written updates provided to support a timely flow of information to stakeholders (Table 24).

Engagement with government agencies and regulators and traditional owners will remain ongoing throughout the project.

Table 24: Stakeholder engagement process

Issue for engagement	Level of engagement	Timing	Scope
Justification for the proposal.	Inform	Underway / ongoing	Consultation undertaken with the EPA and local community to provide information and justification for the need for the proposal.
Foster community advocacy for the project.	Inform	March–April 2024	Community engagement to understand community expectations for the proposal and any key concerns that may need to be addressed.
Environmental referrals to support the proposal.	Consult	Underway / ongoing	Ongoing liaison with key regulators to obtain input into project design and technical investigations to ensure that RIA is not unduly impacting the environment.

4.3 Stakeholder consultation outcomes

Table 25 presents a summary of the key stakeholder consultation undertaken to date for the proposal.

Table 25: Summary of consultation with state government agencies and regulators, local government and the local community

Stakeholder	Date	Type of consultation	Purpose of engagement / issues and topics raised	Proponent response / outcome
DWER's EPA Services	October 2019	Site Visit	RIA and EPA undertook a site visit at the site, with discussion on the plans and potential environmental issues. The investigations to be undertaken were outlined, including dredge plume modelling and jet probing.	DWER EPA were satisfied with the update and the planned works and investigations.
DWER's EPA Services	14/2/2020	Email and meeting	Advice was sought on management measures to be implemented for per- and poly-fluoroalkyl substances (PFAS) during dredging, based on elevated PFAS results in elutriate samples.	DWER EPA was in agreement that the PFAS results in elutriate samples were a result of laboratory contamination. Subsequently, RPS undertook further sediment and surface water sampling and did not identify PFAS at concentrations that would pose a risk to environment and human health. RPS then revised its report with the conclusion that no management measures needed to be considered during dredging.
EPA	12/6/2023	Meeting	RIA and EPA discussed the recommencement of the project and outlined the baseline studies and management plans to be undertaken/developed as part of the progression to referral.	DWER EPA was satisfied with the update and the proposed studies, management plans and timeframes. EPA noted that a Marine Environmental Quality Monitoring and Management Plan (MEQMMP) would be required in addition to the proposed suite of management plans. Further consultation regarding this requirement was undertaken on 19/02/2024 as outlined below.
EPA	13/6/2023	Email	Advice sought on the *Aboriginal Heritage Act 1972* and the relationship with the EP Act.	DWER EPA provided links to published guidance on Aboriginal Cultural Heritage (ACH) matters and the impacts that would be dealt with under *Aboriginal Heritage Act 1972* and EP Act.
EPA	19/2/2024	Email	O2 Marine proposed preparation of an Operational Environmental Management Plan (OMEP) instead of a Marine Environmental Quality Monitoring and Management Plan (MEQMMP) requested by EPA on 12/6/2023 based on the limited ongoing risk to water quality.	The EPA agreed to the proposed change to the management plans supporting the proposal.
Rottnest Foundation	1/3/2024	Email	Included a link to project information website page to inform of the proposal and request feedback. No response received.	No further action.
Fishing groups: BoatingWA / Recfishwest	1/3/2024	Email	Included a link to project information website page to inform of the proposal and request feedback. No response received.	No further action.
Marine groups: UWA/WADDI/ Reef life/AMCS /Pew Trust / Save Our Seas	1/3/2024	Email	Included a link to project information website page to inform of the proposal and request feedback. No response received.	No further action.
DPLH	1/3/2024	Email	DPLH was issued a link to the South Thomson Barge Landing Consultation materials, with a note that if any potential impacts to the Kingstown Barracks (P525) registered place be identified during detailed planning for the site, formal referrals will be progressed.	DPLH acknowledged receipt of notification on 5/03/2024, stating that it appreciated the works do not directly affect a registered place, but it is of interest to the Council given that the island is on its assessment program
DPLH	1/3/2024	Email	Included a link to project information website to inform of the proposal and request feedback. DPLH only requested to be informed of project updates.	No further action. Key project updates will be provided to DPLH as required.
General public submission	1/3/2024–29/3/2024	General public consultation	Completed via RIA website with feedback received via email. The key submissions received from the public that were in opposition to the proposal included: • Potential impacts to the terrestrial and marine environment, such as seagrass loss, land clearing, impact on quokka population, noise, water, and light pollution. • The impact to local boat users, island residents and local visitors. • Impact to the built-heritage value of the Army Groyne. • Concern for the loss of suitable anchoring grounds. • Concern for the increase in traffic along Parker Point Rd and associated public safety risk. • Support for refurbishment of the current jetty and barge landing instead of constructing new facility.	• Project justification is included within this document. • The impact assessment undertaken as part of this documents indicates that the residual impacts to the marine and terrestrial environment are unlikely to be at variance to the EPA's environmental objectives. • Public amenity (noise, lighting, marine traffic and loss of anchoring grounds) context and mitigations are discussed in this document. • Public safety risk (i.e. traffic along Parker Pt Rd) will be addressed by policing and road regulations applicable to Wadjemup / Rottnest Island roads. • Built heritage context of the Army Groyne addressed in separate submission to DPLH.
Rottnest Island Chamber of Commerce (RICC)	6/3/2024	Meeting	Presentation to RICC via a monthly meeting with all business representatives present. Questions and comments were raised in relation to: • In general, there was support for the proposal. • The logistics of ferry operations and luggage deliveries. • General questions about the status of baseline environmental studies. • General questions about project cost and timeframes. • Impacts to moorings and anchorage. • Upgrades to the access road.	• Workshop to be held to discuss ferry operations and logistics once funding and detailed designs are known. • RIA provided verbal responses to the other questions based on information known at the time.
Quokka coaches	7/03/2024	Email	Email received following general consultation: In support of the proposal stating: • Project will benefit the barge operators who currently work in a confined area. • Project will enhance overall visitor impression on arrival.	Noted
Pinnacle Travel Group	20/03/2024	Email	Email received following general consultation. The Pinnacle Travel Group was support of the proposal stating: • Project will increase the experience and amenity for tourists and improve the ability of ferry companies to operate. • Significantly reduce traffic around the jetty and main bus stop, easing congestion.	Noted
EPA	21/3/2024	Email	Advice was sought on the need to do underwater noise modelling or an underwater noise desktop assessment due to the reduced underwater noise impacts from utilisation of vibro hammer piling methodology as opposed to impact hammer.	No response from EPA. RIA decided to undertake the noise modelling instead of a desktop assessment.

Stakeholder	Date	Type of consultation	Purpose of engagement / issues and topics raised	Proponent response / outcome
The Rottnest Society	29/03/2024	Meeting	Presentation to The Rottnest Society on the proposal and to request feedback. Questions and comments were raised in relation to: • Concern for the terrestrial and marine environmental impact. • Concern for lack of proposed revegetation and restoration. • Recommendation that evaluation of current barge landing is undertaken to effectively reduce conflicts with pedestrians. • Notes that information was difficult to source as a result of RIA website being upgraded.	• Project justification is included within this document. • The impact assessment undertaken as part of this documents indicates that the residual impacts to the marine and terrestrial environment are unlikely to be at variance to EPA's environmental objectives.
Wadjemup Aboriginal Reference Group (WARG)	4/04/2024	Meeting	Presentation to WARG to inform of the proposal and seek feedback. Questions and comments were raised in relation to: • In general, there was support for the proposal. • Concern for marine species impacted by the noise from piling, in particular whales. • Enquiry about heritage values in the project area • Works should stop should Aboriginal cultural material be disturbed. • Enquiry about incorporation of renewable energy in the design.	• Cultural heritage (disturbance of Aboriginal heritage) is addressed in this document. • Cultural heritage mitigations identified within the Report of an Ethnographic Aboriginal Heritage Survey of Army Jetty (provided in Appendix M).
Mooring licensees	9/4/2024–24/4/2024	Targeted consultation	Completed via letters and telephone calls to inform licensees about: • Permanent and temporary relation of moorings (where applicable). • General notification of the proposal. • Overall, the responses were opposed to the proposal with general references to: – The impact to current vessel mooring licensees, local boat users, island residents and local visitors. – Impact to the built-heritage value of the Army Groyne. – Concerns about the increased risk/safety to swimmers as a result of increasing marine traffic and boat wash. – Requests for relocation and clarification on the relocation process. – Concern for the loss of suitable anchoring grounds. – Potential impacts to the terrestrial and marine environment (seagrass loss, land clearing, impact on quokka population, noise, water, odour and light pollution).	• Project justification is included within this document. • The impact assessment undertaken as part of this documents indicates that the residual impacts to the marine and terrestrial environment are unlikely to be at variance to the EPA's environmental objectives. • Public amenity (noise, lighting, marine traffic and loss of anchoring grounds) context and mitigations is discussed in this document. • Public safety risk to swimmers and mitigations identified within this document. • Public safety risk (i.e. traffic along Parker Pt Rd) is addressed by policing and road regulations applicable to Wadjemup / Rottnest Island roads. • Built heritage context of the Army Groyne addressed in separate submission to DPLH.
DPLH	24/04/2024	Email	DPLH contacted RIA for an update on the project, including information on the potential heritage implications on built fabric and archaeology.	• RIA's project manager responded on 30/04/2024.
Department of Transport (DoT)	1/5/204	Email	Included a link to project information website to inform of the proposal and request feedback. DoT stated that: • A navigational safety channel is not required. • No additional navigational lights are required.	No changes to the marine safety infrastructure required. No further action.

5 OBJECT AND PRINCIPLES OF THE EP ACT

Section 4A of the EP Act establishes that the objective of the Act is to protect Western Australia's environment, having regard for the following principles:

1. The precautionary principle
2. The principle of intergenerational equity
3. Principles relating to improved valuation, pricing and incentive mechanisms
4. The principle of the conservation of biological diversity and ecological integrity
5. The principle of waste minimisation.

Table 26 identifies how these five EP Act principles have been considered for the proposal and provides a holistic description of how the objective of the EP Act has been met.

Table 26: Object and principles of the EP Act

Principle	Consideration
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 guided by: • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment • An assessment of the risk-weighted consequences of various options	Studies and investigations have been undertaken to assess the potential impacts to key environmental factors relevant to the proposal as summarised in Section 6 to ensure that full scientific certainty supports this impact assessment. The proposal will not cause threat of serious or irreversible damage through avoidance of impacts where possible and the identification and implementation of management measures to address residual impacts.
The principle of intergenerational equity	
The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for benefit of future generations.	The proposal has been designed to meet the EPA's objectives for the relevant environmental factors, with mitigation measures to reduce residual environmental impacts, ensuring sensitive environmental values, their health, function and productivity are maintained for future generations. The proposed relocation of the barge operations takes into consideration the proposed operation of the barge facilities for the life of the project (50 years).
Principles relating to improved valuation, pricing and incentive mechanisms	
1. Environmental factors should be included in the valuation of assets and services.	The proponent accepts that any costs for environmental mitigation, management or offsets are part of the overall proposal costs. This includes residual impact management actions that will be addressed within corresponding management plans.
2. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.	
3. 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.	
4. Environmental goals, have 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.	

Principle	Consideration
The principle of the conservation of biological diversity and ecological integrity	
Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Seven key environmental factors (benthic communities and habitats, coastal processes, marine environmental quality, marine fauna, flora and vegetation, terrestrial fauna and social surroundings) relevant to the proposal have been identified in this report. Site investigations have been undertaken to identify potential impacts and mitigation options to minimise the impact of the proposal and align with the EPA's objective for each environmental factor.
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 will be minimised by adopting the hierarchy of waste controls; avoid, minimise, reuse, recycle and safe disposal during construction and operation of the proposal.

6 ENVIRONMENTAL FACTORS AND OBJECTIVES

This Environmental Supporting Document has been prepared to address the EPA key environmental factors that are relevant to the proposal. Assessment of potential impacts to the environmental factors was undertaken based on the environmental investigations listed in Table 27.

Environmental factors that would potentially be impacted by the proposal are addressed in Sections 7 to 13, as outlined in Table 27.

Table 27: EPA key environmental factors and their relevance to the proposal

Theme	EPA factor	Relevance to proposal	Supporting technical investigations and reports			
			Survey summary	Report	Survey timing	Appendix to this report
Sea	Benthic communities and habitats	There are benthic communities and habitats present within South Thomson Bay.	RPS undertook a benthic habitat assessment to support a previous design of the project in 2019 (RPS, 2019). In 2023, RPS has reviewed and updated this benthic habitat mapping to support the current project design. Sites surveyed in 2023 replicated those surveyed by RPS in 2019, except where habitat of specific interest for ground-truthing were identified in the aerial images.	South Thomson Barge Landing Development; Marine fauna and benthic habitat assessment (RPS, 2024a).	The main field survey was completed between 0830 and 1630 hrs on 24 November 2023 The supplementary field survey was completed on 29 January 2024 between 0830 and 1330 hrs	Appendix B
			Habitat mapping was undertaken using aerial photography and information collected by Rottnest Island Authority, who visually surveyed the benthic habitat at six sites within the 2.54 ha survey extension area.	South Thomson Barge Landing; Benthic habitat assessment: Plume Extension Survey Area (RPS, 2023b).	22 March 2024	Appendix C
	Coastal processes	Construction of the marine component of the proposal has the potential to result in changes to coastal processes.	Baird undertook a coastal processes assessment of the proposal to assess the potential impact the proposed marine infrastructure will have on coastal processes.	South Thomson Barge Landing Development; Coastal processes assessment (Baird, 2025a).	NA	Appendix D
			RPS' Ocean Science & Technology team undertook a peer review of the two reports prepared by Baird to support the proposal.	RIA Peer Review of Dredge Plume Modelling and Coastal Processes Reports (RPS, 2024c)	NA	Appendix E
			A Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) has been prepared for Wadjemup / Rottnest Island to provide strategic guidance for coordinated, integrated and sustainable land use planning and management along the Wadjemup / Rottnest Island coastline. The CHRMAP will inform RIA's future decision-making with respect to areas and assets identified as being at risk of coastal hazards.	Rottnest Coastal Hazard and Risk Management and Adaptation Plan (Cardno, 2023).	NA	-
			A CHRMAP has been prepared to support the project. The CHRMAP provides an overview of coastal hazard at the location, identify key risks and to present the RIA with management strategies for mitigating risks.	South Thomson Bay Barge Development Coastal Hazard Risk Management and Adaptation Plan (Baird, 2025c)	NA	Appendix W
	Marine environmental quality	Construction and operation of the proposal has potential to impact marine environmental quality.	Baird undertook a dredge plume modelling assessment to identify the potential impacts from dredging activities associated with construction of the proposal.	South Thomson Barge Landing Development; Dredge Plume Modelling Assessment (Baird, 2025b).	NA	Appendix F
			RPS' Ocean Science & Technology team undertook a peer review of the two reports prepared by Baird to support the proposal.	RIA Peer Review of Dredge Plume Modelling and Coastal Processes Reports (RPS, 2024c)	NA	Appendix E
			Rottnest Island Authority has undertaken baseline water quality monitoring to support the proposal.	The results from this monitoring are discussed in this report.	Water quality sampling was undertaken in November and December 2023 and January 2024	Appendix G
			RPS undertook sediment sampling to support the project in 2020.	Rottnest Island Army Jetty Dredging; SAP Implementation report (RPS, 2020).	Sediment sampling was undertaken in November 2019	Appendix H
			The Rottnest Island Authority developed a Spill Prevention and Response Plan (SPRP) to provide guidance to staff and other island operators regarding the minimum requirements for chemical and spill management. It was developed using the prevention, preparedness, response and recovery model as recommended by the Department of Water and Environmental Regulation.	Spill Prevention and Response Plan (RIA, 2025)	NA	Appendix V
	Marine fauna	The proposal will result in direct and temporary impacts to marine fauna habitat, while construction and operational activities has the potential to impact marine fauna.	RPS prepared a desktop marine fauna assessment to support the proposal and identify conservation significant marine fauna species likely to occur within vicinity of the proposal.	South Thomson Barge Landing Development; Marine fauna and benthic habitat assessment (RPS, 2024a).	NA	Appendix B
			Tetra Tech prepared an underwater noise assessment to assess potential impacts to marine fauna from piling activities during construction of the proposal.	South Thomson Barge Landing Development; Underwater Acoustic Assessment (Tetra Tech, 2024)	NA	Appendix S
Land	Flora and vegetation	Approximately 0.46 ha of terrestrial vegetation will be directly impacted by the proposal.	Focused Vision Consulting (FVC) undertook a flora and vegetation survey of the South Thomson and Kingstown, areas of Wadjemup / Rottnest Island (Figure 42). The FVC survey encompassed the development envelope and surrounding area.	Flora and vegetation survey; South Thomson and Kingstown, Rottnest Island (FVC, 2023)	Initial reconnaissance flora and vegetation survey – 2 May 2022 Secondary reconnaissance flora and vegetation survey – 30 August 2022	Appendix I
			A reconnaissance survey was undertaken by RPS within the terrestrial survey area shown in Figure 41. EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) states that 'a reconnaissance survey is required where flora and vegetation values are well defined, the area is not likely to support significant flora or vegetation and the scale and nature of the potential impacts are not likely to be significant.' RPS considered these criteria to be met and furthermore that the small size of the site precluded the implementation of a detailed survey using quadrats.	South Thomson Barge Redevelopment Flora and Vegetation Survey (RPS, 2024d)	Reconnaissance flora and vegetation survey – 23 November 2023 Targeted flora survey – 23 to 27 November 2023	Appendix J

Theme	EPA factor	Relevance to proposal	Supporting technical investigations and reports			
			Survey summary	Report	Survey timing	Appendix to this report
			As part of the reconnaissance survey, a review of the report Flora and Vegetation Survey South Thomson and Kingstown, Wadjemup / Rottnest Island (FVC, 2023) was undertaken. The FVC survey encompassed the development envelope and surrounding area. The flora and vegetation data collected by RPS during the reconnaissance survey has been used to support this Environmental Supporting Document.			
	Landforms	No significant landforms are located within or adjacent to the development envelope. Potential impacts to landforms from the proposal is discussed in Section 14.1.				
	Subterranean fauna	The proposal does not involve ongoing groundwater abstraction or dewatering activities. Potential impacts to subterranean fauna from the proposal are not anticipated as discussed in Section 14.1.				
	Terrestrial environmental quality	The site is not mapped as being at risk of acid sulfate soils. The site is not a registered contaminated site. Terrestrial environmental quality is discussed in Section 14.1.				
	Terrestrial fauna	Approximately 0.46 ha of terrestrial fauna habitat will be directly impacted by the proposal.	EcoLogical undertook a basic terrestrial fauna survey within the terrestrial survey area (Figure 46) in accordance with EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment.	Rottnest Island Basic Fauna Survey (EcoLogical, 2024)	31 October 2023	Appendix K
Water	Inland waters	There are no surface water features within or directly adjacent to the development envelope. The proposal does not involve ongoing groundwater abstraction or dewatering activities. Construction and operational activities will be managed to prevent potential impacts to groundwater. The proposal is not considered likely to have a significant impact on inland waters. Potential minor impacts from the proposal are discussed in Section 14.1.				
Air	Air quality	The proposal has the potential to temporarily impact air quality during construction activities from exhaust emissions from construction machinery and dust emissions. Operational activities have the potential to impact air quality through greenhouse gas emissions, which are discussed below. The proposal is not considered likely to have a significant impact on air quality. Potential minor impacts to air quality from the proposal are discussed in Section 14.1.				
	Greenhouse gas emissions	A greenhouse gas assessment was undertaken by Kewan Bond Pty Ltd (Appendix L). This assessment identified that greenhouse gas emissions from construction and operation of the proposal will be below the 100,000 tCO_{2-e} per year threshold where a proposal is required to prepare a greenhouse gas management plan as outlined in the Environmental Factor Guideline: Greenhouse Gas Emissions (EPA 2020). On this basis significant greenhouse gas emissions are not anticipated as discussed in Section 14.1.				
People	Social Surroundings	The proposal is at risk of impacting social surroundings (heritage, bushfire and amenity).	A desktop assessment and stakeholder consultation has been undertaken to support the assessment of potential impacts to social surroundings.	Report of an Ethnographic Aboriginal Heritage Survey of the Army Jetty, Rottnest Island, Western Australia (Brad Goode and Associates, 2019)	Undertaken in 2019. (Advice from the South West Aboriginal Land and Sea Council (SWALSC) confirmed that a more recent survey was not required). Relevant correspondence regarding the Activity Notice is provided in Appendix M.	Appendix M
		There is a slight risk for residual unexploded ordnance (UXO) within vicinity of the development envelope.	Surrich Hydrographics undertook a UXO survey over the previously proposed dredge area.	Marine magnetic survey at proposed barge landing site, South Thomson Bay (Surrich, 2019)	November 2019	Appendix T
			TAMS was engaged by Rottnest Island Authority to supply a vessel and dive team to complete geotechnical investigation at Thompsons Bay South, which included an UXO Assessment.	Rottnest Island Authority - Geological Investigation - Thomson Bay South and UXO investigation / anomaly recovery (TAMS Group, 2019)	December 2019	Appendix T
		There is a risk for the proposal to impact the amenity of South Thomson Bay.	Herring Storer Acoustics undertook an acoustic assessment of noise emissions associated with the existing barge operations to ascertain the potential impacts from the proposal within South Thomson Bay.	Acoustic assessment Rottnest Barge Facility Rottnest Island (Herring Storer, 2024)	May 2024	Appendix U
	Human health	There are no known sources of radiation within the development envelope and there are no stages of the project where exposure to radiation is anticipated. Human health is discussed in Section 14.1.				

7 BENTHIC COMMUNITIES AND HABITATS

7.1 EPA objective

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

7.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed by the EPA to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process. Relevant guidance and policies which have been considered in preparation of this document are discussed in Table 28.

Table 28: Relevant policy and guidance; benthic communities and habitats

Policy and guidance	Consideration
Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016f)	The environmental factor guideline provides guidance on the area of assessment (i.e. Local Assessment Unit (LAU)), and the requirement for describing benthic communities and habitats, determining the cumulative loss of benthic communities and habitats including baseline characteristics, area of historic loss, current extent and areas of approved losses, and additional impacts associated with the proposal. A Benthic habitat assessment (RPS, 2024a) has been undertaken to support the proposal and an impact assessment, including discussion of the LAU and cumulative impact assessment have been undertaken in accordance with this guideline.
Technical Guidance: Protection of Benthic Communities and Habitats (EPA, 2016h)	The EPA's technical guidance is intended to encompass both the current benthic communities that live in or on the seabed and are important for primary or secondary production as well as recognised areas of benthic habitat that have the necessary attributes, such as substrate type, water depth and clarity, degree of exposure to wave energy, to support these communities in the future. When assessing potential impacts to benthic communities and habitats, the EPA focusses on the extent, severity and duration of impacts and requires that proponents use a spatial assessment framework to determine and describe recoverable impacts and cumulative losses of benthic communities and habitats within a defined area. This technical guidance has been considered in assessing impacts to benthic communities.
Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA, 2021a) and National Assessment Guidelines for Dredging (Australian Government, 2009)	The EPA's technical guidance focuses on describing the effects on benthic habitats caused by removal or burial at the sites of dredging and disposal, and the effects of suspended and deposited sediments further afield. The technical guidance provides a methodology for impact prediction, assessment and management of dredging proposal and marine biota – particularly benthic communities.

7.3 Environmental investigations

RPS undertook a benthic habitat assessment to support a previous design of the project in 2019 (RPS, 2019). In 2023, RPS reviewed and updated the 2019 benthic habitat mapping to support the proposal. As part of the 2023 benthic communities and habitat mapping, RPS undertook the following:

- Confirmed the suitability of the LAU defined by RPS (2019) in assessment of benthic impacts from the proposal
- Confirmed the suitability of benthic habitat mapping by Harvey (2009) and its suitability for LAU-scale estimates
- Updated the South Thomson Bay area benthic habitat map previously developed by RPS (2019)
- Confirmed estimates of benthic habitat loss due to the proposed development
- Estimated the cumulative loss of benthic habitat as a consequence of historic activities.

The 2019 Assessment of Benthic Habitats report is provided in Appendix N and the updated Marine Fauna and Benthic Habitat Assessment (RPS, 2024a) is provided in Appendix B.

Baird (2024b) undertook a dredge plume modelling assessment and identified zones of impact from the proposed dredging activities. The eastern extent of the modelled zone of influence was outside the 2019 and 2023 survey area. Therefore, an additional benthic habitat assessment was undertaken of this previously unsurveyed area through an assessment of aerial photography and a visual assessment at six sites. This plume extension survey area comprised 2.54 ha. The Benthic Habitat Assessment: Plume Extension Survey Area (RPS, 2023b) is provided as Appendix C.

The benthic habitat survey areas are provided in Figure 14.

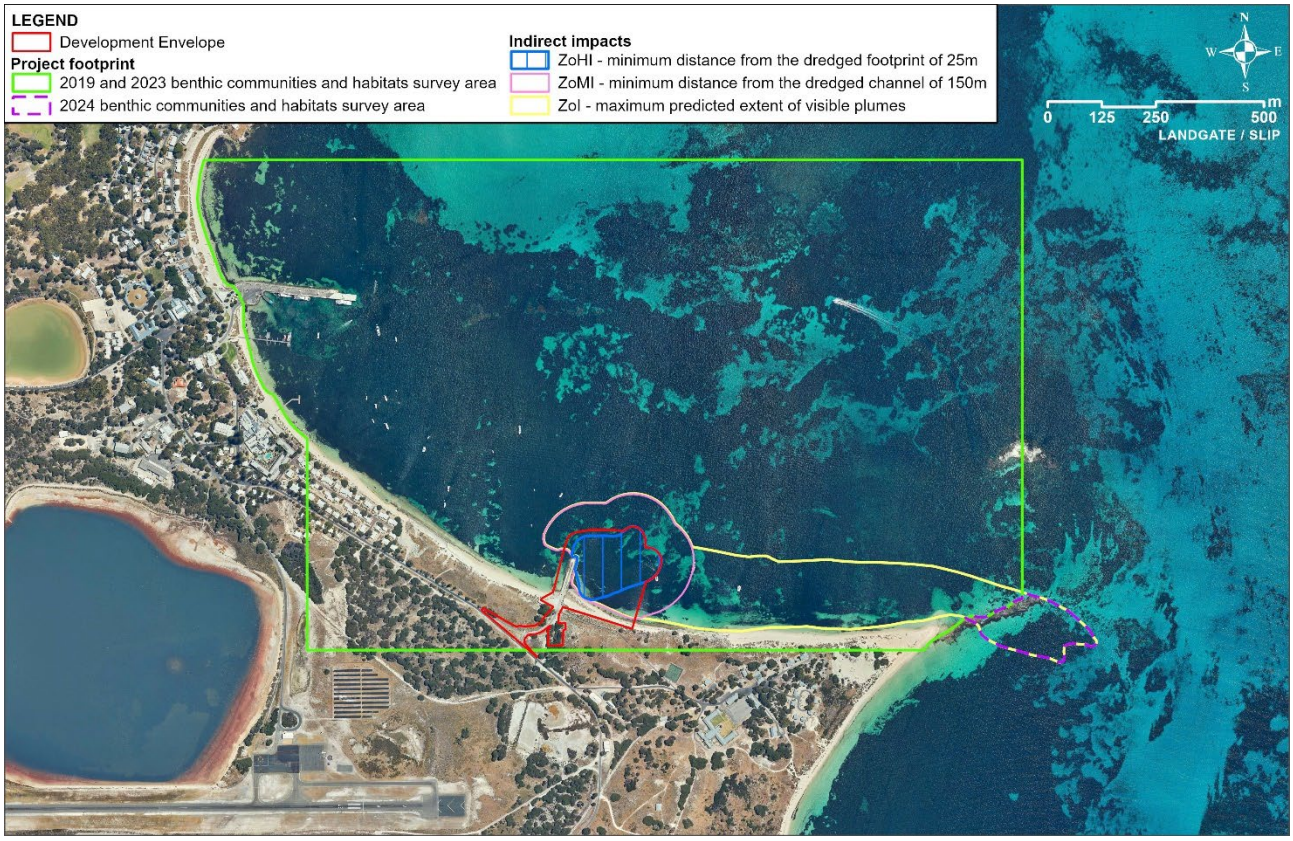


Figure 14: Benthic habitat survey area and plume extension survey area

7.4 Receiving environment

7.4.1 Benthic habitats

Benthic habitat within South Thomson Bay is varied and includes seagrass meadows (*Posidonia* spp.) that comprise approximately 30% of the total seagrass area within the Wadjemup / Rottnest Island / nearshore habitats (RIA, 2023; Harvey, 2009). These meadows, which include *P. sinuosa* and *P. australis*, are recognised as a Priority 3 Western Australian Priority Ecological Community (PEC) by the DBCA due to their importance as a climax community that can take decades to centuries to develop, and their vulnerability to climate change. Other benthic habitats within Thomson Bay includes macroalgae and bare sand, the latter which may be covered by wrack that accumulates seasonally (RPS, 2024a).

Ten species of seagrasses and 347 species of macroalgae have been recorded off Wadjemup / Rottnest Island (RPS, 2019). The seagrasses are largely restricted to sandy substrates and generally grow in sheltered bays and areas protected by reef. The dominant meadow-forming seagrass genera are *Amphibolis* spp. and *Posidonia* spp. (RPS, 2019). Seagrass meadows provide habitat, nursery areas, food and refuge from predation for fish and invertebrate populations. They also stabilise sediments and provide a mechanism for blue carbon sequestration.

Benthic habitats identified within the benthic habitat survey area (Figure 14) includes mixed seagrass, limestone reef / pavement, macro algae dominated and sand / sand with wrack. Seagrasses are dominated by *Posidonia* spp. with a minor component of *Amphibolis* spp. An example of the benthic habitats present within the survey area are shown in Plate 7 and Plate 8.

Benthic habitats mapped within the plume extension survey area (Figure 14) comprised mixed seagrass, limestone reef / pavement and sand / sand with wrack (Figure 15).

Table 29 and Figure 15 show that the dominant benthic communities within the development envelope comprise mixed seagrass and sand / sand with wrack.

Table 29: Benthic communities and habitats present within the survey area and development envelope

	Benthic habitats and communities (hectares)			
	Mixed seagrass	**Macroalgae dominated**	**Sand/sand with wrack**	**Limestone reef/pavement**
Survey area (2019 / 2023 survey area) (refer to Figure 14)	108.10	10.80	42.43	1.79
Survey area (2024 plume extension survey area) (refer to Figure 14)	0.92[1]	0	1.27[1]	0.35[2]
Total survey area	**109.02**	**10.80**	**43.70**	**2.14**
Within the development envelope	2.06	0	1.26	0

[1]Presumed mixed seagrass and sand/sand with wrack identified by aerial image classification and RIA ground-truth data.

[2]Limestone reef pavement identified by aerial image classification only.

The areas of benthic communities and habitats within the overall survey area, zones of predicted indirect impact and development envelope are discussed further in Section 7.5.1.1.

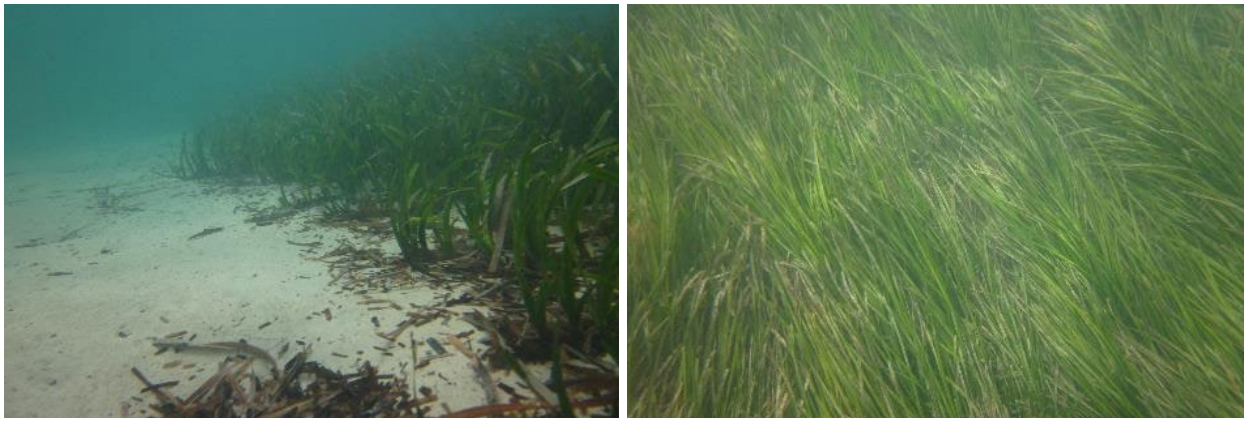


Plate 7: *Posidonia* spp. seagrass meadow edge (first) and full *Posidonia* spp. meadow (second)

Plate 8: Sea anemones on bare sand (first) and *Posidonia* and *Amphibolis* spp. epiphytic brown algae (second)

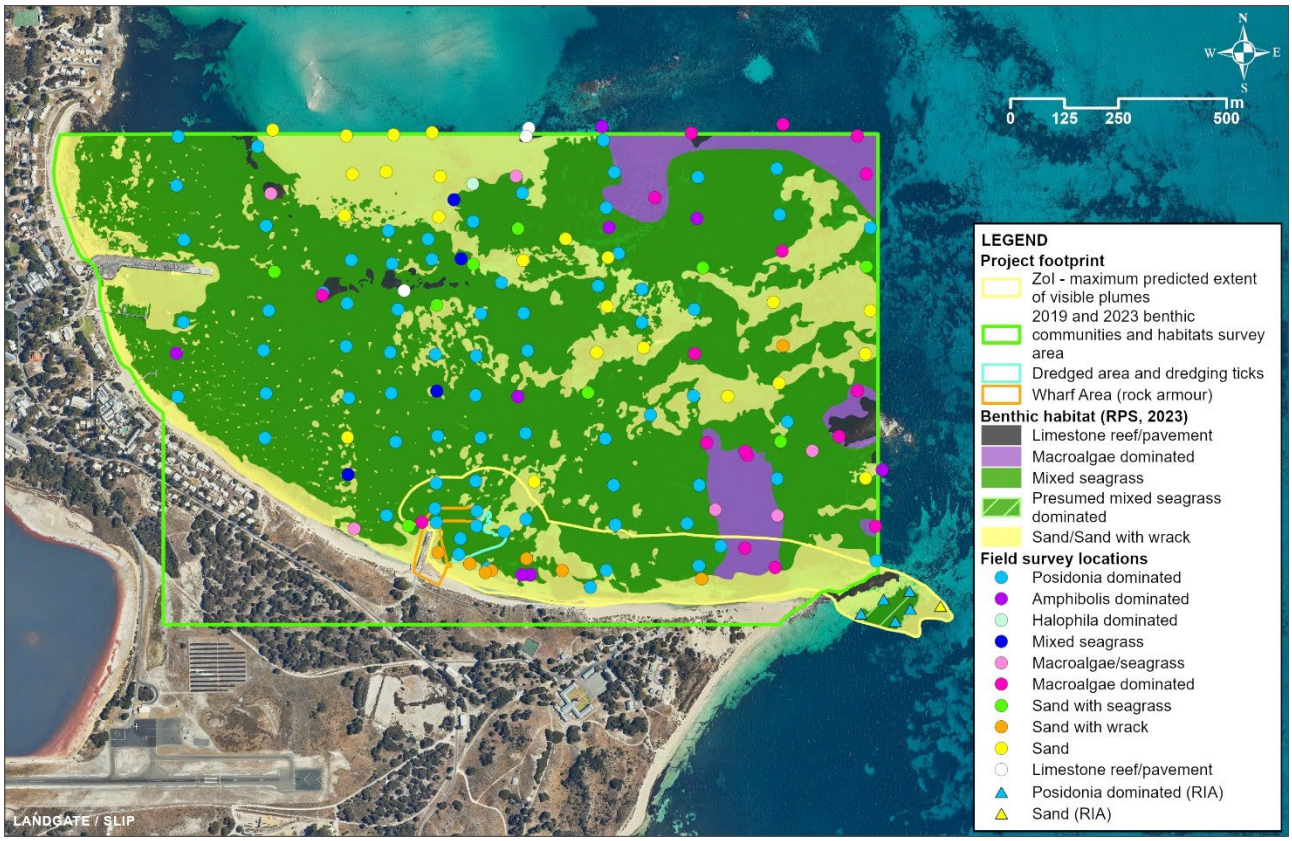


Figure 15: Benthic habitats within the development envelope and predicted extent of visible dredge plume

7.4.2 Local Assessment Unit

A LAU is a geographical area that establishes the spatial context for the calculation and assessment of recoverable impacts and cumulative losses. LAUs are location specific and should reflect local physical, ecological, administrative and jurisdictional considerations.

There is no standard size or shape to a LAU, and they need to be defined on a situation-specific basis (EPA 2016). Guidance on LAU size by the EPA (2016f) indicates that they are typically defined as a ten km stretch of coastline extending five km offshore, although other size LAUs will be considered if justified.

RPS has identified the most appropriate LAU for the proposal as the area mapped by Harvey (2009) (Figure 16) because this area:

- Comprises 2,746 ha of described habitat in which historic habitat loss from anthropogenic impacts have been estimated
- Represents a complete island ecosystem
- Is consistent with EPA (2016f) guidance on the size of an LAU.

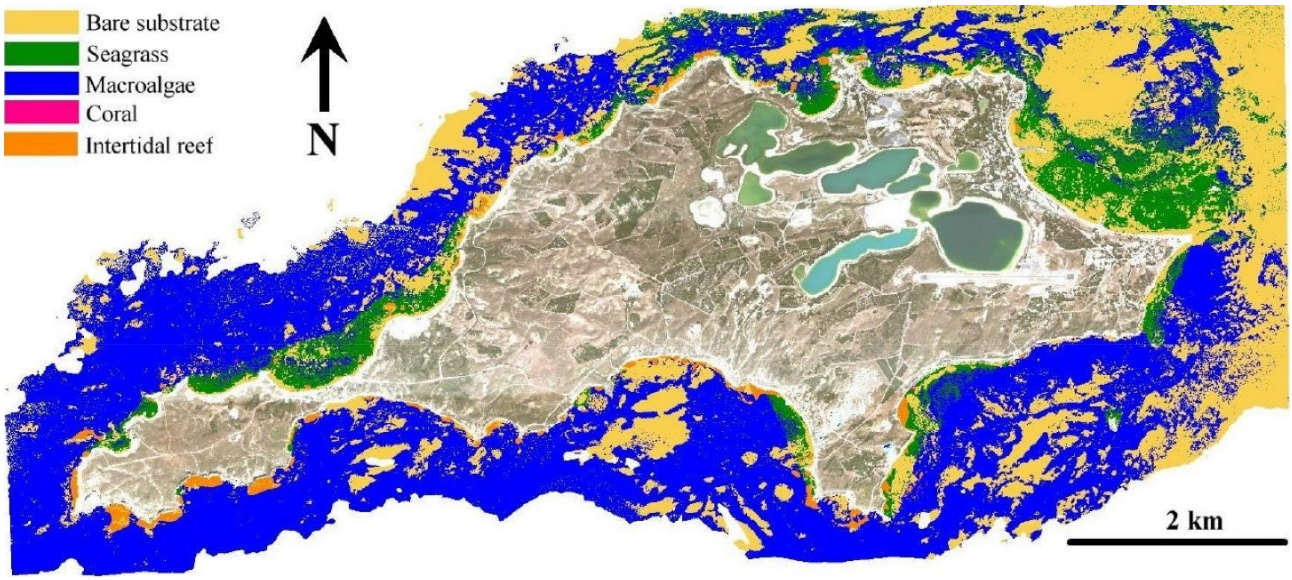


Figure 16: Benthic habitat map of Wadjemup / Rottnest Island (Harvey, 2009)

The benthic habitat map of Wadjemup / Rottnest Island (Figure 16) was developed using hyperspectral imagery obtained in 2004 and based on spectral signatures of the dominant habitat components. At the broadest scale, areas of substrate with visible organisms were separated from bare substrates in the image with an overall accuracy of 95%, whereas at the finest scale, bare substrates and dominant species or genera were separated with an accuracy of 70% (Harvey 2009). This benthic habitat modelling technique has the highest accuracy (84%; validated in field) and is able to identify small patches of habitats (RPS, 2024a).

When comparing the benthic habitat map by Harvey (2009) to aerial images taken in August 2014 and 2018 and observations from the site visit, RPS (2019) identified discrepancies in areas of seagrass and sand habitat, possibly due to fine-scale misclassification of habitats by Harvey (2009). In particular, RPS (2019) observed that misclassification of mobile wrack as seagrass by Harvey (2009) would result in an overestimate of the amount of seagrass loss within the development envelope.

Due to the potential for fine-scale misclassification of habitat, additional sites were added to the 2023 benthic habitat survey to further clarify high risk wrack accumulation areas, such as the shallows and habitat edges where misclassification is more likely, and supplementary observations were noted detailing when wrack was present, and if it occurred at the edge of a benthic habitat. This information assisted in the aerial footage comparisons to predict areas of benthic habitat and calculate benthic habitat losses more accurately.

A comparison of the habitat maps developed in 2019 and 2023 by RPS and the benthic habitat map developed by Harvey (2009) for the same area, indicates that the map by Harvey (2009) underestimates the current extent of seagrass in south Thomson Bay and overestimates the macroalgae dominated habitat. The map by Harvey (2009) also indicates more areas of sand than the current study. The two RPS survey results (2019 and 2023) were more similar to each other than Harvey (2009), however there was an increase in macroalgae/limestone pavement and an increase in seagrass and sand / sand with wrack observed. These were relatively small differences though and may be accounted for with the alteration of site locations (and the additional sites) in the 2023 survey.

Based on RPS' assessment of the suitability of the LAU (Appendix B) and considering the guidance by EPA (2016f) that the understanding of benthic communities and their habitats should be proportional to the scale of the proposed development, the habitat map developed by Harvey (2009) is considered satisfactory for description of habitat within the LAU defined for the proposed development. However, because the Harvey (2009) map does not reflect the current area of seagrass habitat within the survey area, assessment of seagrass habitat loss due to the proposed development should be based on the habitat map developed during the 2023 study.

Details of the LAU are provided in Figure 15 and Table 30.

Table 30: Benthic communities and habitats present within the LAU (Harvey 2009)

	Benthic habitats and communities (hectares)				
	Mixed seagrass	Macroalgae dominated	Sand/sand with wrack	Limestone reef/pavement	Sand
LAU (Harvey 2009) (refer to Figure 16)	406.65	1388.07	-	-	874.63

7.5 Potential environmental impacts

Table 31 provides the potential key impacts to benthic communities and habitats from the proposal. For the purposes of the impact assessment, the following assumptions have been made:

Direct impacts:

- All benthic habitats and communities within the development envelope will be directly impacted. The development envelope encompasses:
  - The wharf area and a buffer of 7 m to 125 m around the proposed marine infrastructure which encompasses the potential impacts from the halo effect
  - The dredge area and Zone of High Impact (ZoHI)
  - An area for construction vessel moorings within a portion of the Zone of Moderate Impact (ZoMI) is located within the development envelope. Construction vessel mooring will be temporary, and benthic communities and habitats are expected to recover from associated impacts.

Indirect impacts:

- Indirect impacts to the benthic habitats and communities within the Zone of Moderate Impact (ZoMI).

Within the Zone of Influence (ZoI), there may be some small changes in environmental quality associated with dredge plumes during the dredging operations. However, these changes would not result in a detectible impact on benthic communities and habitats.

Table 31: Potential impacts on benthic communities and habitats

Phase	Impact class	Works / operations	Potential impacts
Construction	Direct	• Dredging • Construction of the wharf • Reclamation Mooring of construction vessels	**Loss of benthic habitats** • Direct impacts to benthic communities and habitats includes: – Permanent loss of 2.85 ha of benthic communities and habitat from construction of the wharf, dredging activities and the ZoHI, comprising: ○ 1.98 ha mixed seagrass. The loss of 1.98 ha of mixed seagrass represents 0.5% of seagrass within the Local Assessment Unit (LAU)). ○ 0.87 ha sand with wrack. – Temporary loss of 0.47 ha of benthic communities and habitats from mooring of construction vessels, comprising: ○ 0.08 ha mixed seagrass. The temporary loss of 0.08 ha of mixed seagrass represents 0.02% of seagrass within the LAU. 0.39 ha sand with wrack.
	Indirect	Dredging	**Reduced environmental quality** • Temporary decrease in light availability resulting from increased turbidity in the water column within the ZoI and ZoMI, leading to reduced primary productivity and potential increased mortality rates of primary producers under conditions of prolonged or acute exposure. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI and would not result in a detectible impact on benthic communities and habitats. • Increased sedimentation rates, or burial, resulting in stress or increased mortality rates (under extreme conditions). • Accidental fuel spills resulting in reduced water quality and impacts on benthic communities and habitats.

Phase	Impact class	Works / operations	Potential impacts
			Loss of benthic habitats • Recoverable loss of 3.71 ha of benthic habitats and communities within the ZoMI (the area within which predicted impacts on benthic organisms are recoverable within a period of five years following completion of the dredging activities): – Temporary loss of 2.62 ha mixed seagrass – Temporary loss of 1.09 ha sand with wrack. **Introduction of invasive marine species** Alteration of the natural benthic communities in the area caused by the introduction of invasive marine species (IMS).
Operation	Direct	No additional loss of benthic communities and habitats relative to the construction period are anticipated from operation of the proposal. Any direct impacts from operation of the proposal, such as vessel mooring, have already been captured in the direct (permanent) impacts discussed above.	
	Indirect	• Barge movements Maintenance dredging (potential contingency)	**Introduction of invasive marine species** • Alteration of the natural benthic communities in the area caused by the introduction of IMS. **Impacts from marine infrastructure** • Altered water flows and sediment transport caused by the presence of new marine infrastructure. **Reduced environmental quality** Accidental fuel spills to water resulting in reduced water quality and impacts on benthic communities and habitats.

7.5.1 Assessment of impacts

7.5.1.1 Loss of benthic habitat

Construction will result in the following direct impacts to benthic communities and habitats comprising mixed seagrass and sand / sand with wrack:

- Direct loss of benthic communities and habitats within the development envelope from dredging activities and construction of the marine infrastructure. These impacts are considered irreversible.
- Temporary loss of benthic communities and habitats from mooring of construction vessels within the portion of the ZoMI which occurs within the development envelope (Figure 10). Research indicates that recovery from mechanical disturbances (such as the proposed temporary mooring) to seagrass can take between 1 to 25 months (Neus Sanmartí, 2021). However, as these direct impacts are located within the modelled ZoMI, recovery of impacts to benthic communities and habitats within this area is anticipated to take up to 5 years.

After disturbance, seagrasses can recolonise an area through horizontal spread via rhizomes beneath the surface, and the establishment of seedlings through sexual reproduction. Once a stressor is removed, seagrass recovery depends on a range of factors, including the proximity of adjacent meadows, season, and environmental conditions. Generally, Posidonia beds in Western Australia have been shown to recover within 5 years after disturbance (Cambridge, 2002).

The generation of a suspended sediment plume from construction activities such as dredging will result in indirect impacts to benthic communities and habitats, as discussed in Section 7.5.1.1.1.

7.5.1.1.1 Dredge plume modelling assessment

A Dredge Plume Modelling Assessment was undertaken by Baird (2024b) (Appendix F) for the project. The modelling assessment calculated the zones of impact which are expected to have an impact on benthic communities and habitats. The zones of impact are shown in Figure 15 and summarised in Table 32.

Table 32: Predicted zones of impact (Baird, 2025b)

Zone of impact	Definition	Boundary thresholds
Zone of High Impact (ZoHI)	The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means 'lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less'.	Boundary of the dredging and placement area. Where sedimentation/burial is >10 cm or 10,000 g/m^2.
Zone of Moderate Impact (ZoMI)	The area within which predicted impacts on benthic communities or habitats are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the ZoHI.	The 95th percentile of the area where a TSS concentration of >10 mg/L was exceeded. Where sedimentation / burial is 5–10 cm or 5,000–10,000 g/m^2.
Zone of Influence (ZoI)	The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI.	The 100th percentile of the area where a TSS concentration of >2 mg/L above background was exceeded (representing the maximum predicted extent of visible plumes).

Consultation was undertaken with Baird regarding potential for increased suspended sediment resulting from other constructions activities proposed, such as the placement of dredge spoil in the reclamation area. Baird confirmed that proposed reclamation activities will not impact the modelled zones of impact.

7.5.1.1.2 Impact assessment

Construction will result in direct and indirect impacts to benthic communities and habitats comprising mixed seagrass and sand / sand with wrack through dredging activities, construction of the marine infrastructure and mooring of construction vessels. As indicated in Table 29, the following impacts to benthic communities and habitats are predicted as a result of construction of the proposal (Figure 17):

- **Direct impacts** to:
  - Direct (permanent) impacts to 1.98 ha of mixed seagrass and 0.87 ha of sand / sand with wrack within the development envelope. The loss of 1.98 ha of mixed seagrass represents 0.5% of seagrass within the LAU.
  - Direct (recoverable) impacts to 0.08 ha of mixed seagrass and 0.39 ha of sand / sand with wrack within the development envelope from the temporary mooring of construction vessels. The mooring of construction vessels is proposed within the portion of ZoMI which occurs within the development envelope. Mooring of construction vessels is unlikely to directly impact all of the 0.08 ha of seagrass within this area. However, for the purposes of this impact assessment, a conservative approach has been adopted and the entirety of the area has been included as a direct (temporary) impact. The temporary loss of 0.08 ha of mixed seagrass represents 0.02% of seagrass within the LAU.
- **Indirect (recoverable) impacts** to:
  - 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI will recover within a five-year period.

5.13 ha of mixed seagrass, 1.13 ha macroalgae dominated community, 0.35 ha of limestone reef / pavement and 6.70 ha of sand / sand with wrack is located within the ZoI. Changes in environmental quality associated with dredge plumes in the ZoI are not predicted to result in a detectible impact on benthic biota.

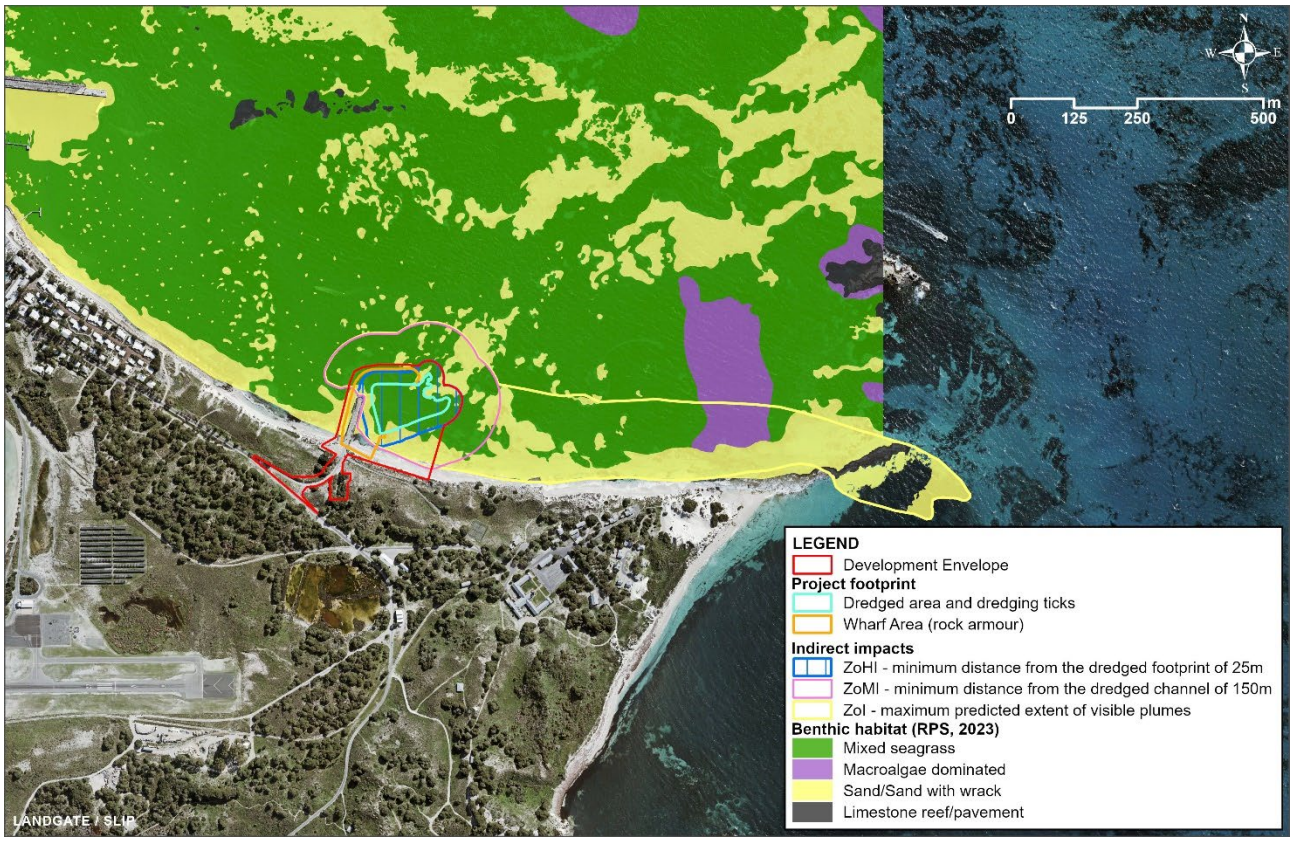


Figure 17: **Predicted indirect (within the ZoMI and ZoI) and direct impacts (within the development envelope) to benthic communities and habitats**

Table 33: **Predicted direct and indirect impacts to benthic communities and habitats**

Area	Habitat (hectares)				
	Mixed seagrass	Macroalgae dominated	Sand/sand with wrack	Limestone reef/ pavement	Total area of benthic communities and habitats (ha)
Survey area	**109.02**	**10.80**	**43.70**	**2.14**	**165.66**
Development envelope	**2.06**	**0**	**1.26**	**0**	**3.32**
Direct impacts					
Area directly (permanent) impacted within the development envelope	1.98	0	0.87	0	**2.85**
Area directly (recoverable) impacted within the development envelope	0.08	0	0.39	0	**0.47**
Total area directly impacted	**2.06**	**0**	**1.26**	**0**	**3.32**
Indirect (recoverable) impacts					
Zone of Moderate Impact (ZoMI) outside the development envelope	2.62	0	1.09	0	**3.71**
Zone of Influence (ZoI)*	5.13	1.13	6.70	0.35	**13.31**
Total area indirectly impacted	**7.76**	**1.13**	**7.79**	**0.35**	**17.03**

* Changes in environmental quality associated with dredge plumes in the ZoI are not predicted to result in a detectible impact on benthic biota.

7.5.1.1.3 Cumulative habitat loss

The spatial extent of the LAU is discussed in Section 7.4.2. Calculation of cumulative benthic habitat loss within a defined LAU requires the following estimates of the extent of benthic habitat (EPA, 2016). A summary of how these estimates were determined is provided below:

- Prior to all human-induced disturbance
- At the time of the proposed development
- Remaining after the development is completed.

Oceanica (2013) estimated the historic benthic habitat loss associated with vessel moorings (mooring scars) and jetties from a review of aerial imagery taken in March 2008 (RPS, 2024a). These estimates are only for seagrass because there was insufficient data for other habitat types such as coral and macroalgae, and because seagrass meadows typically occur within sheltered, shallow bays where this marine infrastructure is located. This is considered acceptable for the current study because seagrass is the key impacted habitat.

The estimates by Oceanica (2013) are considered conservative as they did not consider other potential sources of anthropogenic stressors such as eutrophication, propeller scour and sedimentation, and assumed that areas of bare sand around marine infrastructure and moorings were previously 100% seagrass. Oceanica's estimate also did not take into account the potential seagrass regrowth that was observed by RPS when comparing the 2019 and 2023 survey data. Historical loss within the LAU was determined to be 7.95 ha.

These estimates use the data by Harvey (2009) to estimate the 2013 extent of seagrass habitat as 398.70 hectares which, when combined with the amount lost due to human-induced disturbance (7.95 hectares) results in an estimated 406.65 hectares of seagrass habitat within the LAU prior to impacts due to human activities (RPS, 2024a).

Based on the above estimates, the permanent loss of seagrass habitat as a consequence of the proposal (1.98 ha, 0.5% of the LAU) results in a cumulative (historical (1.95% of the LAU) and projected (0.5% of the LAU)) loss of seagrass within the LAU of 2.45%.

7.5.1.2 Reduced marine environmental quality

Increased suspended sediment from dredging and construction activities has the potential to result in the following indirect impacts to benthic communities and habitats.

- Decreased light availability, leading to reduced primary productivity and potential increased mortality rates of primary producers under conditions of prolonged or acute exposure.
- The increased turbidity has the potential to result in increased scour (abrasion) of membranes and/or blockage of breathing or filter feeding structures, resulting in stress or increased mortality rates.
- Increased sedimentation rates, or burial, resulting in stress or increased mortality rates (under extreme conditions).

Based on the dredge plume modelling assessment undertaken by Baird (2024b), these indirect impacts are expected within the ZoMI. However, a detectable impact on benthic communities and habitats from increased turbidity resulting from the project within the ZoI is not predicted (Baird, 2025b).

Benthic communities and habitats located within the ZoMI outside the development envelope that may be impacted by changes in marine environmental quality include:

- 2.62 ha of mixed seagrass
- 1.09 ha of sand / sand with wrack.

Accidental fuel spills from fuel storage and refuelling, resulting in reduced water quality, may impact on benthic communities and habitats.

Impacts to marine environmental quality are discussed further in Section 9 of this document.

7.5.1.3 Impacts from marine infrastructure

Marine infrastructure from the proposed development can impact benthic habitats and communities through change in coastal processes and shading effects.

Baird (2024a) undertook a coastal processes assessment to determine the effect of the proposed marine infrastructure on coastal processes. The assessment identified that due to the presence of the existing Army Groyne, which already influences the coastal processes within South Thomson Bay, it was predicted that changes to coastal processes as a result of the proposal would be minimal. Impacts to coastal processes from the proposal are discussed further in Section 8.

A five-metre buffer is notionally considered a reasonable estimate of the area surrounding marine infrastructure that may be subject to events causing additional habitat loss, including localised erosion, slumping of dredged area walls and backwash (the halo effect) (EPA, 2016f). The development envelope encompasses an area around the proposed marine infrastructure ranging from 7 m to 125 m. Consequently, the development envelope encompasses the area which may be affected by the halo effect and impacts outside the development envelope as a result of the halo effect are not anticipated.

Potential impacts to coastal processes from the proposed marine infrastructure is discussed in more detail in Section 8 of this report.

7.5.1.4 Introduction of invasive marine species

There is potential for vessels used during construction and implementation of the proposal to result in the introduction or spread of IMS. This impact is discussed further in Section 10.5.1.5.

7.6 Mitigation

Table 34 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of benthic communities and habitats to address the key potential impacts.

Table 34: Application of mitigation hierarchy to benthic communities and habitats

Potential impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Loss of benthic communities and habitat	Direct	Avoid	• Site selection includes an already disturbed area of 0.19 ha of disturbed seabed within the existing Army Groyne footprint. As benthic communities and habitats are widespread within South Thomson Bay, total avoidance of direct impacts is not possible • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3.	**Residual impacts to benthic communities and habitats includes the permanent removal of 2.85 ha of benthic communities and habitats and the temporary removal (recoverable within 5 years) of 0.47 ha benthic communities and habitats.**
		Minimise	• The AECOM and PAEMAC value engineering works helped to not only reduce dredging requirements, but also reduce the footprint to the minimum possible to achieve the objectives of constructing a new barge landing. • Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the Construction Environmental Management Plan (CEMP) (Emerge, 2025a) (Appendix P) and Dredging Environmental Monitoring and Management Plan (DEMMP) (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area of benthic communities and habitats permanently impacted by the proposal is limited to the development envelope. These measures include: – Employing high-resolution positioning system to control dredge operations to ensure that they do not occur outside the proposed dredging area – Implementing the management measures to minimise impacts to marine environmental quality as outlined in Section 9.6 of this report.	
		Rehabilitate	Areas of benthic communities and habitats within the development envelope which will be directly impacted by the construction of the wharf and dredging activities are not proposed to be rehabilitated. However, the benthic communities and habitats (0.08 ha of mixed seagrass and 0.39 ha of sand with wrack) within the area of ZoMI within the development envelope which will be impacted from the temporary mooring of construction vessels are anticipated to recover within five years (EPA, 2016h and Neus Sanmartí, 2021).	
		Offset	Benthic communities and habitat offsets are not considered applicable to the proposal.	
	Indirect	Avoid	Discussed under 'Reduced marine environmental quality (i.e. increased turbidity and sedimentation rates)'.	
		Minimise		
		Rehabilitate		
		Offset		
Reduced marine environmental quality (i.e. increased turbidity and sedimentation rates)	Indirect	Avoid	Total avoidance of indirect impacts to marine environmental quality and benthic communities and habitats is not possible.	**The temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI.** Baird (2024b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address a temporary increase in TSS / turbidity during construction. Implementation of these management plans ensures that residual impacts to benthic habitats and communities from indirect impacts will not be significant.
		Minimise	• Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area impacted by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 15 – Implementation of the CEMP and DEMMP will ensure that permanent loss of benthic communities and habitats resulting from construction of the proposal does not exceed 3.32 ha – The potential for indirect water quality impacts to adjacent areas will be mitigated through implementation of the Marine Water Quality Monitoring Program provided in Appendix B.2 of the DEMMP. This program is discussed in further detail in Section 9.6 • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential indirect impacts to benthic communities and habitats from impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP for suspended sediment – Implementation of the tiered management framework provided in the DEMMP – Implement the Benthic Communities and Habitat Monitoring Program provided in the DEMMP, including: ○ Baseline surveys within one month prior to commencement of dredging to establish baseline conditions ○ Reactive surveys during dredging (as required). ○ If a reactive survey was required during the dredging activities, then post-dredging surveys will also be undertaken (i.e. it will not be required if the water quality triggers were not exceeded). – Use of silt curtains which will minimise the potential impacts associated with increased suspended sediments – The placement of geofabric (such as Texcel 1200R) textile weave along the bund wall will ensure that the placement of dredge spoil during reclamation works will not impact or increase the dredge plume zones • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the document Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	
		Rehabilitate	Construction effects will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities. It is predicted that the temporary impacts within the ZoMI are recoverable within a period of five years following completion of the dredging activities (Baird, 2025b).	
		Offset	Benthic communities and habitat offsets are not considered applicable to the proposal.	
Alteration of the natural benthic communities in the area caused by the introduction of invasive marine species.	Indirect	Avoid	Total avoidance of vectors for the potential introduction and distribution of IMS is not possible. The construction and implementation of the proposal requires marine vessels to be used in the area.	**No residual impacts expected.** Implementation of the CEMP (Emerge, 2025a) (Appendix P) and OEMP (Appendix Q) will ensure there is no introduction of IMS.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and Operational Environmental Management Plan (OEMP) (Appendix Q) will minimise the risk of introduction of IMS • The proposal will be primarily used for barge operations to transport bulk cargo to and from Wadjemup / Rottnest Island. As such, the likelihood of vessels visiting the facility from international, or interstate waters is low. However, any vessels from interstate or international waters will comply with Commonwealth biosecurity requirements and complete the WA Department of Primary Industries and Regional Development 'Vessel Check' risk assessment (https://vesselcheck.fish.wa.gov.au). The risk assessment must indicate that the vessel poses a low risk of IMS. • All vessels will have a ballast water management plan and ballast water exchanges will be in accordance with IMS requirements and the Commonwealth *Biosecurity Act 2015*.	
		Rehabilitate	Rehabilitation is not considered applicable to this impact.	
		Offset	Benthic communities and habitat offsets are not considered applicable to the proposal.	
Altered water flows and sediment transport caused by the presence of new marine infrastructure	Indirect	Avoid	Complete avoidance of effects on coastal processes from the proposal is not avoidable.	**Additional residual impacts from those discussed under 'loss of benthic communities and habitat' are not anticipated.**
		Minimise	• Baird (2024) identified that, due to the presence of existing infrastructure within the project footprint (Army Jetty), changes to coastal processes as a result of the proposal would be minimal • A five-metre buffer is notionally considered a reasonable estimate of the area surrounding marine infrastructure that may be subject to events causing additional habitat loss, including localised erosion, slumping of dredged area walls and backwash (the halo effect). The development envelope encompasses an area around the marine infrastructure ranging from 7 m to 125 m. Consequently, the development envelope encompasses the area that may be impacted by the halo effect and impacts outside the development envelope as a result of the halo effect are not anticipated.	
		Rehabilitate	The 'halo effect' from the proposed marine infrastructure is included in the calculated direct impacts (within the development envelope). Areas of benthic communities and habitats which will be directly impacted are not proposed to be rehabilitated.	
		Offset	Benthic communities and habitat offsets are not considered applicable to the proposal.	

7.7 Assessment and significance of residual impact

The residual impacts to benthic communities and habitats following the implementation of mitigation measures are summarised below:

- Permanent loss of mixed seagrass of up to 1.98 ha (or 0.5% of mixed seagrass within the LAU)
- Permanent loss of sand / sand with wrack of up to 0.87 ha. It should be noted, that post-dredging activities, sand / sand with wrack is likely to accumulate and therefore this impact is unlikely to be permanent.
- Temporary loss of mixed seagrass of up to 0.08 ha (or 0.02% of mixed seagrass within the LAU) and up to 0.39 ha of sand / sand with wrack within the development envelope due to direct impacts from mooring of construction vessels. It is anticipated that impacts to these benthic communities and habitats will be recoverable within a period of up to five years.
- Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2024b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities.

Consideration of the significance of the residual impacts on benthic communities and habitats is discussed in Table 35.

Table 35: Consideration of the significance of the residual impacts on benthic communities and habitats

Matters for consideration	Response
Object and principles of the EP Act	RPS undertook a benthic habitat assessment to support a previous design of the project in 2019 (RPS, 2019). In 2023, RPS reviewed and updated the 2019 benthic habitat mapping to support the proposal. These benthic communities and habitat assessments were undertaken to address the EPA's Benthic Communities and Habitat objective and the principles of the EP Act have been specifically addressed in relation to the proposal.
Values, sensitivity and quality of the environment which is likely to be impacted	Baseline investigations have been undertaken to determine the existing benthic communities and habitat values and sensitivity of the receiving marine environment. Investigations identified the presence of seagrass within the development envelope, ZoHI, ZoMI and ZoI. Seagrass is sensitive to impacts from dredging activities, including the generation of suspended sediments in the water column which can result in smothering and reduce light reaching the seagrass meadows. Implementation of the CEMP, DEMMP and OEMP will avoid and minimise environmental impacts on the more sensitive benthic communities and habitats receptors (e.g. seagrass). With implementation of these management plans, the residual impacts are limited to: • Permanent loss of mixed seagrass of up to 1.98 ha (or 0.5% of mixed seagrass within the LAU) • Permanent loss of sand / sand with wrack of up to 0.87 ha. It should be noted, that after dredging activities, sand / sand with wrack is likely to accumulate and therefore this impact is unlikely to be permanent. • Temporary loss of mixed seagrass of up to 0.08 ha (or 0.02% of mixed seagrass within the LAU) and up to 0.39 ha of sand / sand with wrack within the development envelope due to direct impacts from mooring of construction vessels. It is anticipated that impacts to these benthic communities and habitats will be recoverable within a period of up to five years. • Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2024b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.

Matters for consideration	Response
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	Impacts to benthic communities and habitats from the proposal will be managed through implementation of the CEMP, DEMMP and OEMP. With implementation of these management plans, the residual impacts are limited to: • Permanent loss of mixed seagrass of up to 1.98 ha (or 0.5% of mixed seagrass within the LAU) • Permanent loss of sand / sand with wrack of up to 0.87 ha. It should be noted, that after dredging activities, sand / sand with wrack is likely to accumulate and therefore this impact is unlikely to be permanent. • Temporary loss of mixed seagrass of up to 0.08 ha (or 0.02% of mixed seagrass within the LAU) and up to 0.39 ha of sand / sand with wrack within the development envelope due to direct impacts from mooring of construction vessels. It is anticipated that impacts to these benthic communities and habitats will be recoverable within a period of up to five years. • Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2024b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities.
Resilience of the environment	Benthic communities and habitats are susceptible to impacts from the proposal. Direct impacts will result in the permanent loss of 1.98 ha of seagrass within the development. Indirect impacts within the ZoMI will be recoverable within a period of five years and impacts within the ZoI are not predicted to be observable. As such, it is considered that the marine environment is resilient to the indirect impacts from the proposal.
Consequence of the application of the mitigation hierarchy to the proposal.	The construction and operation of the proposal will result in the removal or disturbance of benthic communities and habitats within South Thomson Bay. However, habitat removal will be limited to the development envelope. Direct impacts within the development envelope are considered to comprise a small proportion (2.06 ha, of which 0.08 ha is considered recoverable) of the total habitat within the South Thomson survey area and the broader LAU (0.52% of the LAU, of which 0.02% is anticipated to recover within 5 years). Additionally, the indirect (recoverable) disturbance of benthic habitats and communities during construction will not have lasting impacts from construction outside the development envelope. As such, there will be no significant consequences from the proposal on benthic communities and habitats in the LAU. Any changes to benthic community population dynamics are likely to be temporary and reversable and the habitat to be directly removed is a very small proportion of the habitat available in the broader LAU and is well represented in the area. Following the application of the mitigation hierarchy (Table 34) and taking into consideration the above significance of residual impacts, RPS considers that permanent impacts to 0.5% of the LAU will not result in a species or ecosystem requiring protection under statute or increase the cumulative impact to a critical level.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment has been completed with a high level of confidence and in accordance with relevant legislation and guidelines as per Table 28.
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

7.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to benthic communities and habitats are:

- **Relevant to dredging and construction activities:**
  - Irreversible impacts to benthic communities and habitats are limited to the wharf structure and ZoHI.
  - No observable impacts to BCH outside of the ZoMI.
- **Relevant to operational activities:**
  - No irreversible impacts to benthic communities and habitats outside of the development envelope during operational activities associated with the proposal, such as maintenance dredging activities (excludes other RIA activities associated with other approvals e.g. mooring installation).

As the impact assessment identified low residual risks to benthic communities and habitats following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet the EPA's objective for benthic communities and habitats (i.e. to protect benthic communities and habitats so that biological diversity and ecological integrity are maintained).

8 COASTAL PROCESSES

8.1 EPA objective

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

8.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process. Table 36 lists the relevant EPA guidance, other state policy and planning documents that have been considered in preparation of this document.

Table 36: Relevant policy and guidance; coastal processes

Policy and guidance	Consideration
Environmental Factor Guideline: Coastal Processes (EPA, 2016i)	The environmental factor guideline identifies the dynamic nature of coastal processes and key linkage with benthic communities and habitats, influencing both community types and distribution. The guideline recognises that changes to coastal processes resulting from a proposal may not cause impacts at that location, but impacts may occur further along the coastline or offshore. These considerations have underpinned a holistic assessment of total potential impacts and cumulative environmental effects of the proposal on coastal processes. A Coastal Processes Assessment (Baird, 2025a) has been undertaken to support the project and is summarised in Sections 8.3 and 8.4.
SPP No. 2.6: State Coastal Planning Policy (Western Australian Planning Commission, 2013a) and State Coastal Planning Policy Guidelines (Western Australian Planning Commission, 2013b)	The objective of the SPP No. 2.6, and its associated guidelines that is most relevant to the proposal is 'to ensure that the location of coastal facilities takes into account coastal processes, landform stability, coastal hazards, climate change and biophysical criteria'. SPP 2.6 has been addressed in the Coastal Processes Assessment (Baird, 2025a) and the Rottnest Island CHRMAP (Cardno, 2023).
Coastal Hazard Risk Management and Adaptation Planning Guidelines (Department of Planning and Western Australian Planning Commission, 2014)	The Rottnest Island CHRMAP (Cardno, 2023) addresses potential long-term impacts to coastal processes (including climate change) and has been used to inform this report. A site specific CHRMAP has also been prepared to support the project and provide an overview of coastal hazard at the location, identify key risks and to present the RIA with management strategies for mitigating risks. The South Thomson Bay Barge Development Coastal Hazard Risk Management and Adaptation Plan is provided in Appendix W.
Sea Level Change in Western Australia, Application to Coastal Planning (Department of Transport, 2010)	The Intergovernmental Panel on Climate Change (IPCC) has developed four representative concentration pathway scenarios for different population sizes, economic activity, lifestyle, energy use, land use patterns, technology and climate policy pathway trajectories and their possible resulting emissions. The sea level rise assessment for the Rottnest Island CHRMAP (Cardno, 2023) adopted the following sea level rise allowances (metres):

Source	2022	2030	2050	2080	2122
DoT 2010 and IPCC 2021	0.00	0.05	0.18	0.48	0.94

8.3 Environmental investigations

8.3.1 Coastal processes assessment

A detailed Coastal Processes Assessment (Baird, 2025a) (Appendix D) has been prepared to predict the potential impacts of the new infrastructure on coastal processes within South Thomson Bay. Due to the dynamic nature of coastal processes and linked interdependencies associated with coastal variables, this section assesses the cumulative impacts to coastal processes from the barge development.

An additional assessment was undertaken by Baird (2025) to provide additional data on the potential for accumulation of sediment and wrack against the structure and the potential implications and requirements for maintenance dredging. Results from this assessment are reflected in the South Thomson Bay Barge Development Coastal Hazard Risk Management and Adaptation Plan (Appendix W).

8.4 Receiving environment

8.4.1 Regional setting

Wadjemup / Rottnest Island is located approximately 20 km west of the port of Fremantle. The island is 11 km long with 63 sheltered beaches and 20 bays and is the remnant of the Pleistocene dune ridges that is surrounded by large quantities of coral reefs and rock formations. The coastline contains cells that are spatially discrete sections of coastline that include the intersection of both marine and land-based structures that connect through the exchange of sediment (Stul T, 2015).

8.4.2 Wave climate

The wave climate of the coastline from Bunbury to Perth is dominated by deep-water waves that are generated by large-scale weather systems over the Indian and Southern oceans. Seasonal variability in the wave climate generally peaks during the winter months (Baird, 2025a). The wave conditions in Thomson Bay are generated by two principal sources:

- Long period swell waves (>8 seconds) that are generated in the Southern Ocean and which travel around the north side and south side of the island by diffraction and refraction to enter Thomson Bay as low amplitude swell.
- Short period (<8 seconds) wind sea waves approach the bay from an easterly direction. These short period waves are generated by easterly winds acting over the fetch between the Perth coastline and Wadjemup / Rottnest Island.

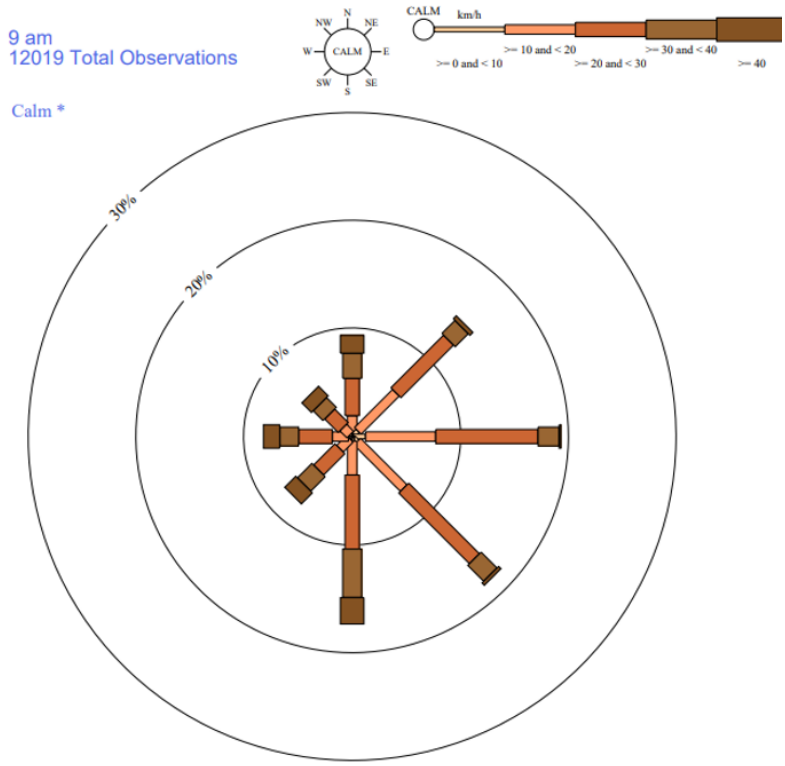
8.4.3 Water levels and tides

Seasonal variability of surges and mean sea level (peaking around June–July and May respectively) interacts with the twice annual tidal cycle (peaking in June and December) to cause a distinct seasonal peak to water levels around June, although high water levels are possible from frequent winter storms from May to September, or through rare impact of extratropical cyclones.

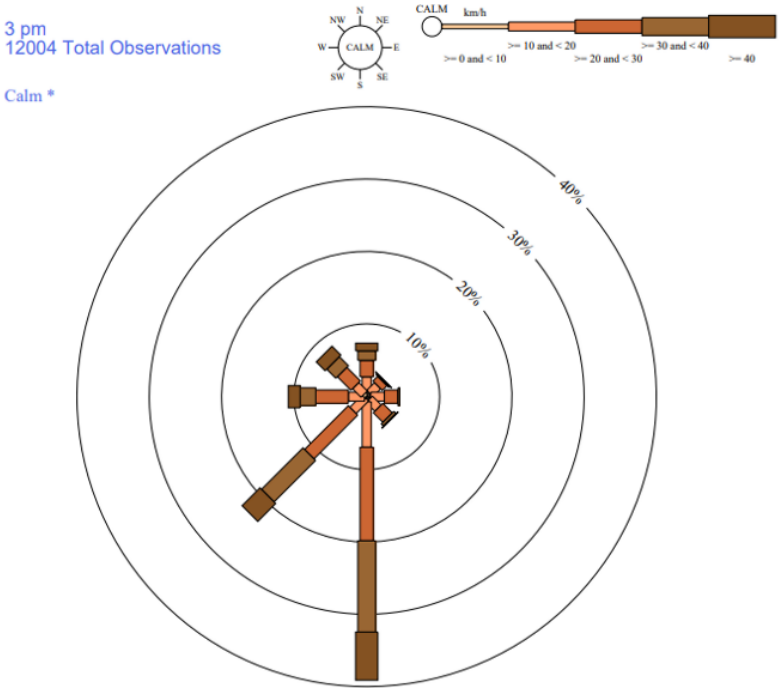
The tides at Wadjemup / Rottnest Island are mainly diurnal with a spring tide range of approximately 0.7 m and neap tide range of 0.5 m. The water level peaks during the June solstice. There is no tide gauge on Wadjemup / Rottnest Island with the nearest measured data location being the tide gauge at the Fremantle boat harbour, which is considered generally representative of the tidal regime on Wadjemup / Rottnest Island in Thomson Bay. Tidal planes are summarised in Baird (2024).

8.4.4 Wind conditions

The land – sea breeze cycle is a dominant local feature of the wind climate of the area, typically with easterly winds in the morning and southerly to westerly winds in the afternoon. Predominant wind patterns recorded at Rottnest Island weather station (009193) are shown in Graph 2 and Graph 3. Typical spring–summer wind patterns are predominantly south-easterly to south-westerly winds, while winter wind patterns are generally westerly with periods of elevated winds that correspond with storm fronts.



Graph 2: **Rose of wind direction versus wind speed in km/h (29 Nov 1987 to 10 Aug 2023); 9.00 am conditions (Commonwealth of Australia, 2023)**



Graph 3: **Rose of wind direction versus wind speed in km/h (29 Nov 1987 to 10 Aug 2023); 3.00 pm conditions (Commonwealth of Australia, 2023)**

8.4.5 Bathymetry and reefs

Bathymetric data has been captured in high resolution by the Department of Transport (DoT) from the shoreline out to approximately 30 m depth (Figure 18). There are high resolution local bathymetric surveys in Thomson Bay around the Army Groyne captured in 2017 and 2020 (Baird, 2025a) (Figure 18).Bathymetry data sourced from the Department of Transport within and adjacent to the development envelope indicates that the bathymetry ranges from approximately 0 mAHD to -5.8 mAHD (Figure 19).

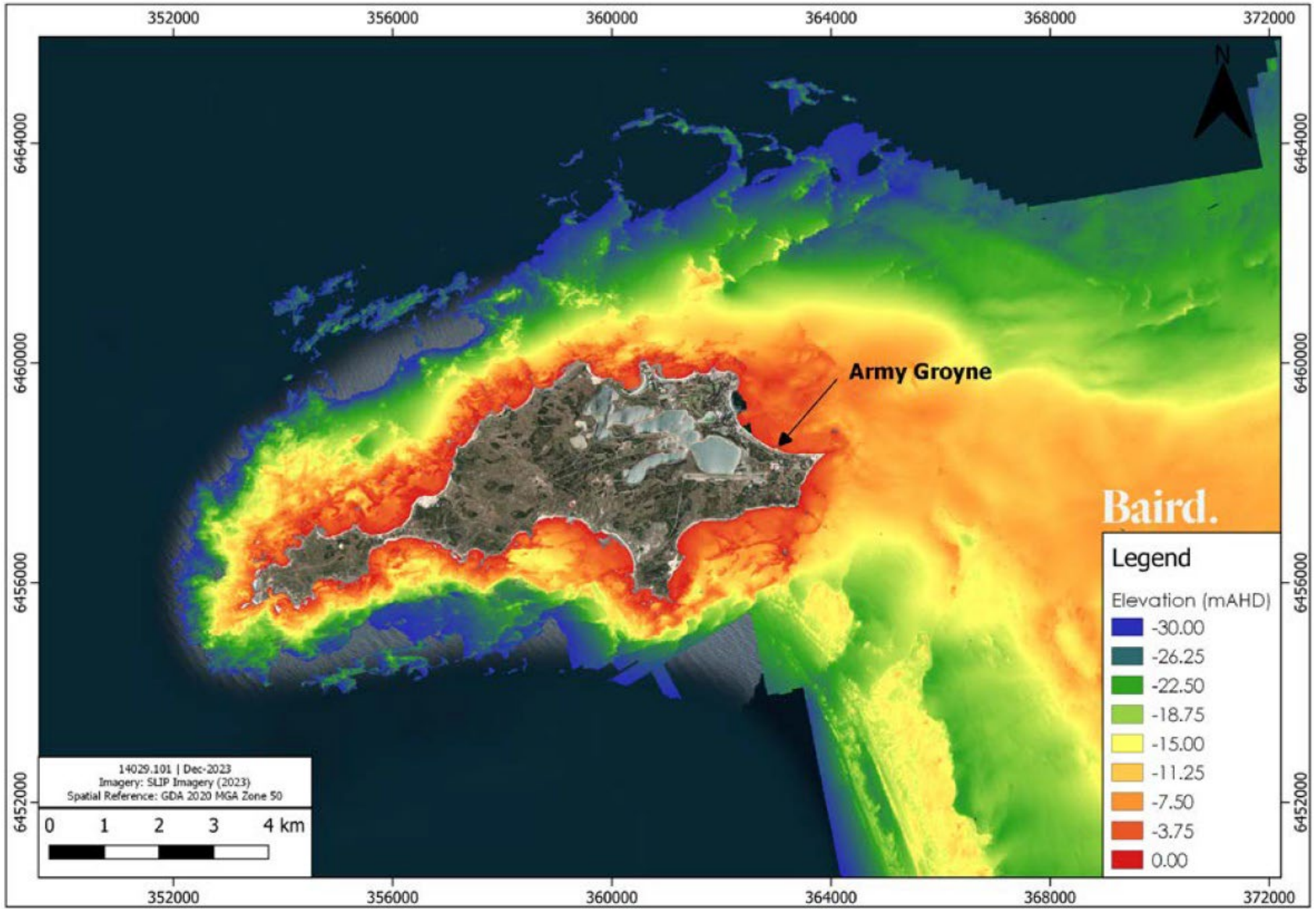


Figure 18: Bathymetry

Figure 19: Bathymetry proximate to the development envelope

8.4.6 Sediment cells

Sediment cells are mapped by Stul et al. (2015) for three spatio-temporal scales along the coast between Cape Naturaliste and Moore River:

- Primary Cells – these relate to large landforms and consider potential changes to the coastline over timescales of more than 50 years.
- Secondary Cells – these incorporate contemporary sediment movement on the shoreline and potential landform responses to inter-decadal changes in coastal processes.
- Tertiary Cells – these are defined by the reworking and movement of sediment in the nearshore and are relevant for seasonal and inter-annual changes to the beach face.

The sediment cell most relevant to the proposed facility at South Thomson Bay is the R14b tertiary cell extending from Bathurst Point to Philip Point (Figure 20), with due consideration made to its position within the R14 and the secondary cell between North Point and Philip Point and the R06D Primary cell extending from Fremantle to Safety Bay and out to Wadjemup / Rottnest Island along the Garden island Ridge.

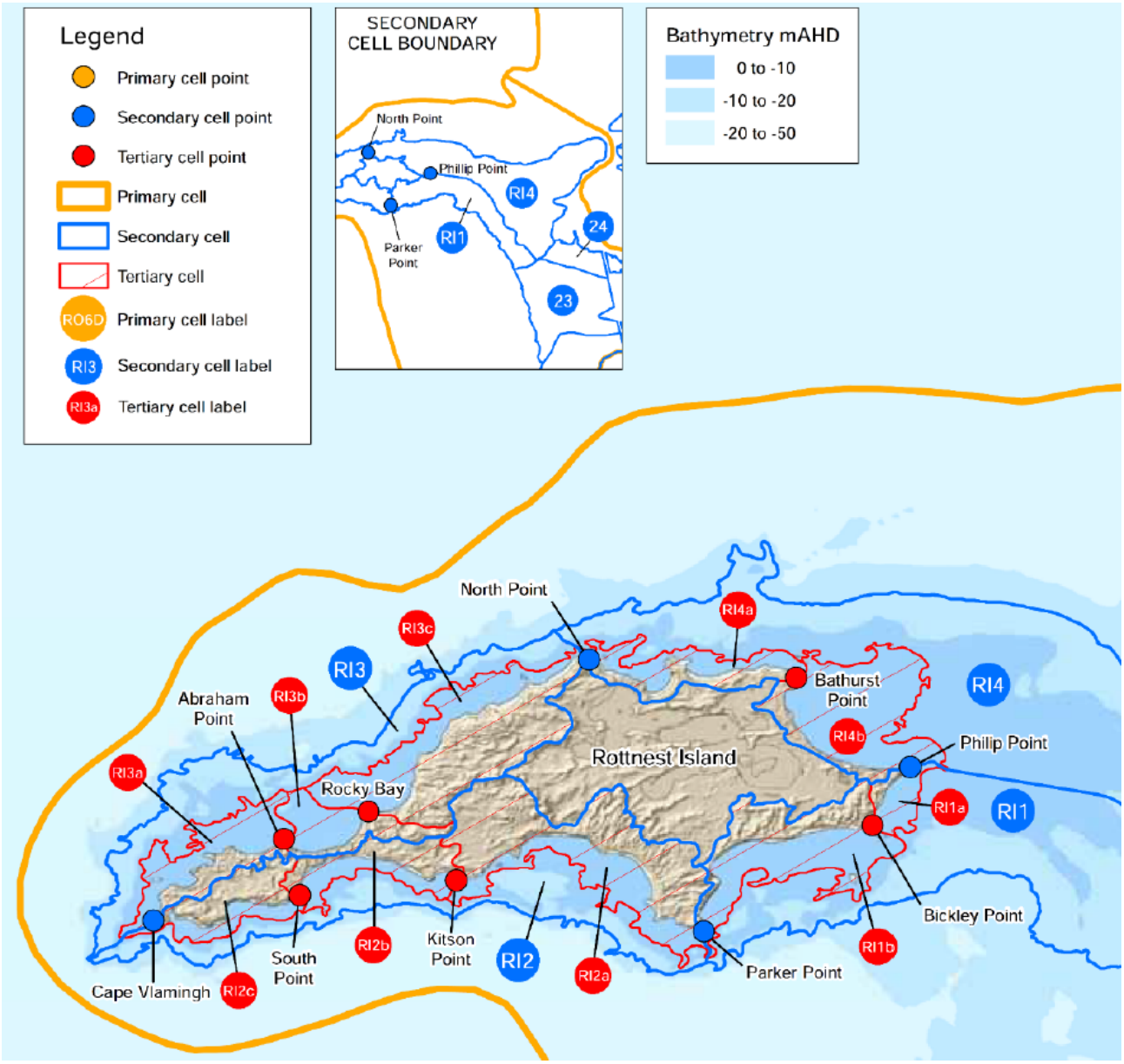


Figure 20: Secondary and Tertiary sediment cells around Wadjemup / Rottnest Island (Stul et al. 2015)

8.4.7 Shoreline characteristics and coastal structures

The shoreline of Thomson Bay follows an arcuate shape between Bathurst Point and Philip Point, truncated in places by the construction of impermeable land attached structures including the Main Passenger Ferry Jetty and the Army Groyne (Plate 9 and Plate 10). The shoreline consists mainly of sandy perched beaches, with much of the beach sitting on top of rock platforms or pavements (Seashore Engineering, 2019) and interspersed with rocky outcrops and limestone cliffs (Short, 2005).

Plate 9: **Public boat ramp at the Army Groyne**

Plate 10: **Army Groyne structure with a view of Thomson Bay to the west and view of the groyne from the eastern seaward side**

8.4.8 Wrack accumulation

Seagrass wrack is the accumulation of detached macrophytes and seagrass in the surf zone and on beaches and, in south-western Australia, it is primarily comprised of seagrasses and macroalgae. The accumulation of seagrass wrack has the potential to impact the amenity of marinas, boat harbours and beaches due to physical obstruction, and decay.

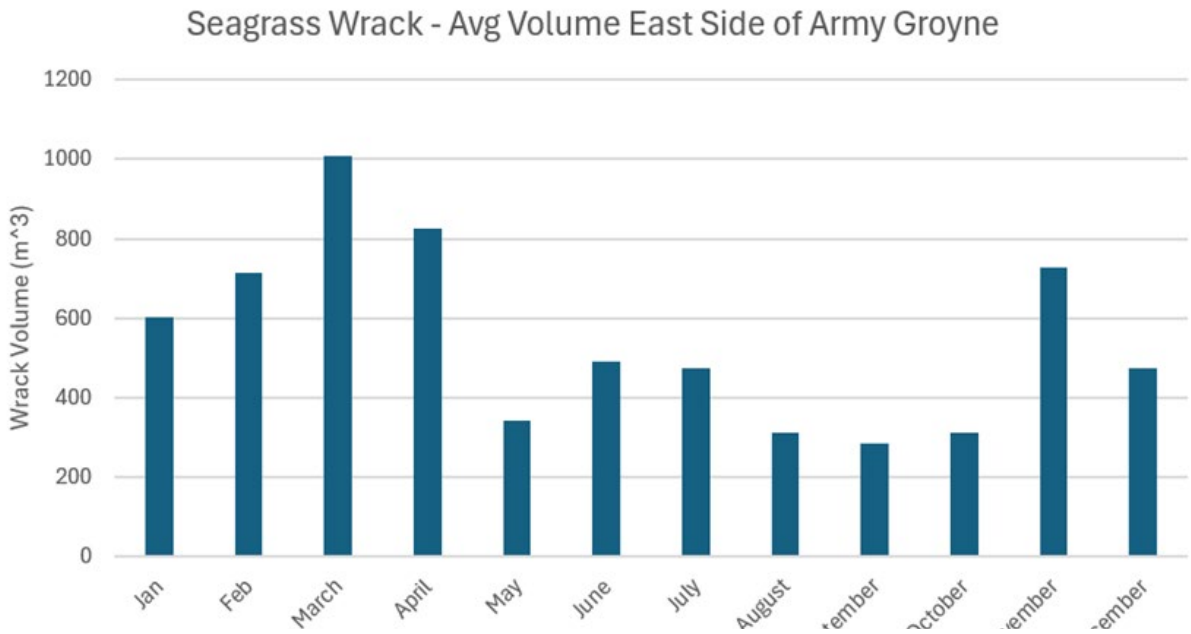
Baird undertook an assessment of both the current and predicted seagrass wrack accumulation against the current Army Groyne and proposed infrastructure, as summarised in Sections 8.4.8.1 and 8.4.8.2. Baird estimated that the future volume of wrack which may accumulate on the eastern side of the groyne will be 1,600 m^3 per annum.

8.4.8.1 Current wrack accumulation estimates

Historical imagery shows that wrack has and continues to accumulate primarily on the eastern side of the existing Army Groyne where the groyne meets the shoreline. Baird examined 25 aerial images over the development envelope from various times of year to estimate the wrack accumulation that occurs on the east of the Army Groyne, both on land and in the nearshore area. Graph 4 presents the average volume estimate on the east side of the Army Groyne, indicating that while wrack is always present, the volume changes seasonally.

Wrack volume builds up over the summer months between November and February and peaks in March. While the wrack volume along the east of groyne appears to be at its lowest through winter months, driven by coastal processes. Wrack is 'naturally cleared' from the east of the groyne through autumn and early winter under local wave conditions driven by strong north and north easterly winds. These wave conditions clear away the sediment build up from the east side of the Army Groyne, resuspending and moving the wrack.

Wrack starts to build up again in spring (September to November) as dominant wind conditions swing to the southeast and south and local wave conditions reverse to drive longshore current east along Thomson Bay.



Graph 4 Estimate of seagrass wrack accumulation on the eastern side of the Army Groyne

8.4.8.2 Predicted wrack accumulation against the proposed Barge Landing Development

The present mechanism for the wrack to be naturally cleared from the eastern side of the groyne in the autumn months by north and north easterly wind driven storm waves, as discussed in Section 8.4.8.1, will be reduced once the proposed barge landing development has been constructed due to the hooked shape of the proposed wharf. The predicted reduction in wave energy within the structure and at the shore is expected to result in continual build-up of wrack on the east side of the structure and within the dredged area.

There is potential for wrack entering the dredge area over time to cause navigation issues. Although, it is likely that this wrack will be redistributed by the vessels using the facility and resuspended by propeller action.

8.5 Potential environmental impacts

Construction processes are unlikely to result in impacts to coastal processes.

Engineered structures can influence coastal processes through interruption of currents, waves and sediment transport that can change the morphology of the seabed, beach and/or coast. The proposed wharf has potential to impact coastal processes during the operational phase.

Table 37 provides the potential key impacts to coastal processes from the proposal.

Table 37: Potential impacts on coastal processes

Phase	Impact class	Works/ operations	Potential impacts
Construction	Construction activities are unlikely to result in significant impacts to coastal processes.		
Operation	Direct	Wharf	• Interruption to longshore currents • Interruption to longshore sediment transport • Interruption to seagrass wrack transport trajectories and deposition sites • Reduction of wave energy in lee of structures • Reflection of waves off structures resulting in increased wave energy in the structures vicinity. In the Coastal Processes Assessment (Baird, 2025a) (Appendix D), Baird noted that the reflection of waves off structures, potentially resulting in increased wave energy, was unlikely to impact adjacent moorings and this increase in energy is anticipated to be minimal.

8.5.1 Assessment of impacts

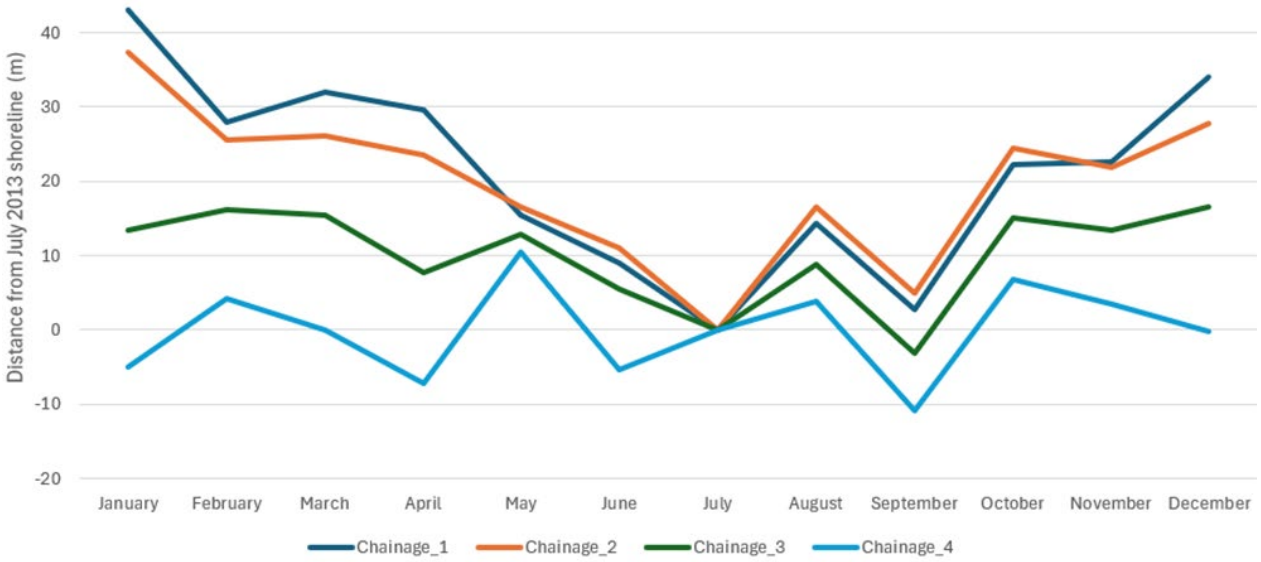
8.5.1.1 Interruption to longshore currents

8.5.1.1.1 Interruption to longshore sediment transport

The existing Army Groyne comprises a limestone armoured groyne that is approximately 100 m in length and features a 7 m wide compacted limestone crest. The existing groyne compartmentalises the shoreline by interrupting longshore sediment transport within Thomson Bay. This is demonstrated by seasonal accretion and erosion of the shoreline on either side of the groyne (Cardno, 2023). Baird (2025) examined 25 aerial images encompassing the development envelope to analyse changes in the shoreline position on the east of the Army Groyne. The change in shoreline position along the four transects shown in Figure 21 was analysed monthly, with the results shown in Graph 5. The shoreline position nominally represents the mean sea level in each aerial photo analysed.

It is estimated that the average sediment volume above the mean sea level (that which can be easily managed by land-based dredging methods) that is moving to the area between the transects on the east side of the groyne from winter to the summer peak is 800 m^3. Future projected volumes moving west under longshore sediment transport (800 m^3) are not expected to be affected by the proposed wharf structure.

The present mechanism for sediment to be naturally cleared from the eastern side of the groyne in the autumn months by north and north easterly wind driven storm waves and longshore sediment transport will be reduced due to the hooked shape of the proposed wharf. The reduced wave energy at the shore is expected to result in continual build-up of sediment on the east side groyne over subsequent summers if no management is undertaken.



Graph 5 Analysis of existing shoreline movement

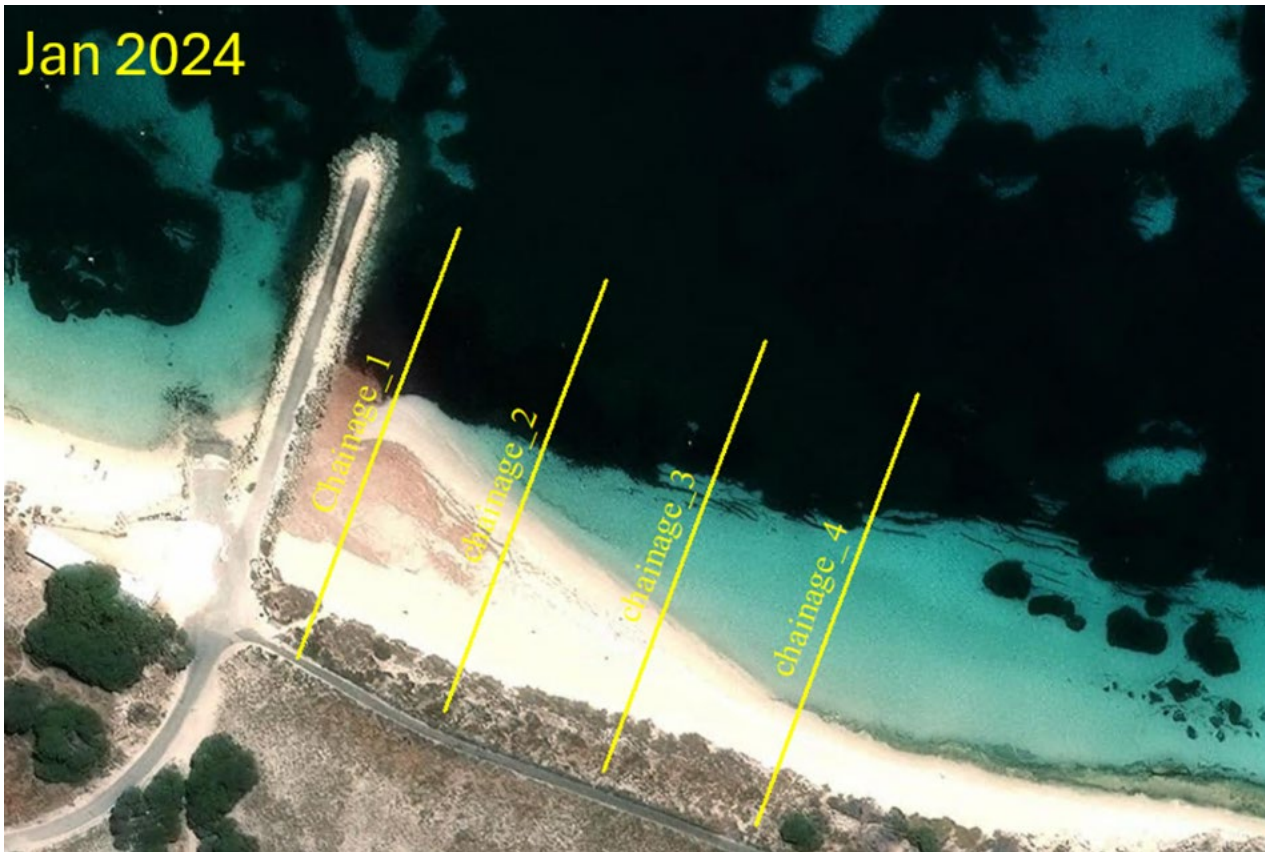


Figure 21 Location of shoreline transects (Baird 2025)

The majority of longshore sediment transport is currently blocked by the existing Army Groyne, and it is predicted that the proposed wharf will block longshore sediment transport to a similar degree (Baird, 2025a). Therefore, due to the existing impacts to coastal processes, the proposal is not expected to result in a significant change in longshore sediment transport. However, based on existing coastal processes around the Army Groyne and the Coastal Processes Assessment undertaken by Baird, it is predicted that there may be some potential for build-up of sediment on the eastern side of the proposed wharf. This build up may be slightly greater than existing conditions and will be localised to the proposed infrastructure, it is not considered substantial enough to have a significant impact on the overall shoreline position along South Thomson Bay (Figure 22).

Considering the above analyses, it is unlikely that the proposed barge development would have a significant impact on the sediment dynamics along South Thomson Bay (Baird, 2025a) and therefore the proposal is not expected to result in a significant change in longshore sediment transport within the bay. However, there are likely to be requirements for maintenance and removal of accumulated sediments on the eastern side of the proposed structure.

8.5.1.1.2 Interruption to seagrass wrack transport trajectories and deposition sites

The proposed development of the South Thomson Barge Landing Development will not have a significant impact on the timing or volume of wrack accumulation across the beaches of Thomson Bay, other than the impact that the Army Groyne already has on the dynamics in South Thomson Bay (Baird, 2025a).

However, as discussed in Section 8.4.8, there is potential for the accumulation of seagrass to occur on the eastern side of the proposed development structure (Figure 23). A review of existing seagrass accumulation on the eastern side of the Army Groyne indicates that this predicted accumulation against the proposed structure will not be a significant change to that already experienced (Plate 11), however there may be a requirement for removal of this wrack as part of ongoing maintenance. Baird estimates that the future volume of wrack which may accumulate on the eastern side of the groyne will be 1,600 m^3 per annum. Dredging and removal of this built up wrack material may be required every 2 to 5 years. However, actual frequency and volumes requiring maintenance and removal would be confirmed through monitoring.

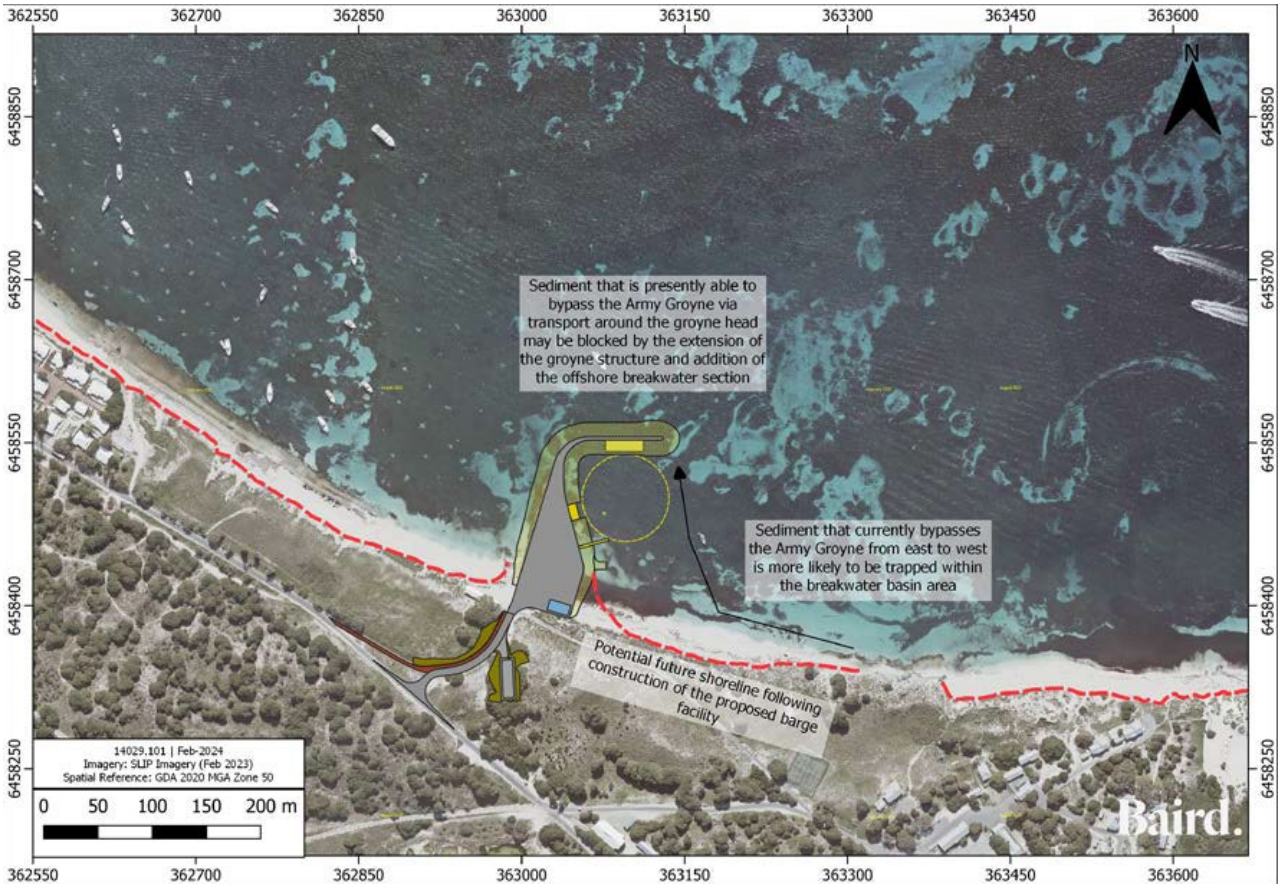


Figure 22: Potential impact of proposed facility on sediment dynamics in South Thomson Bay

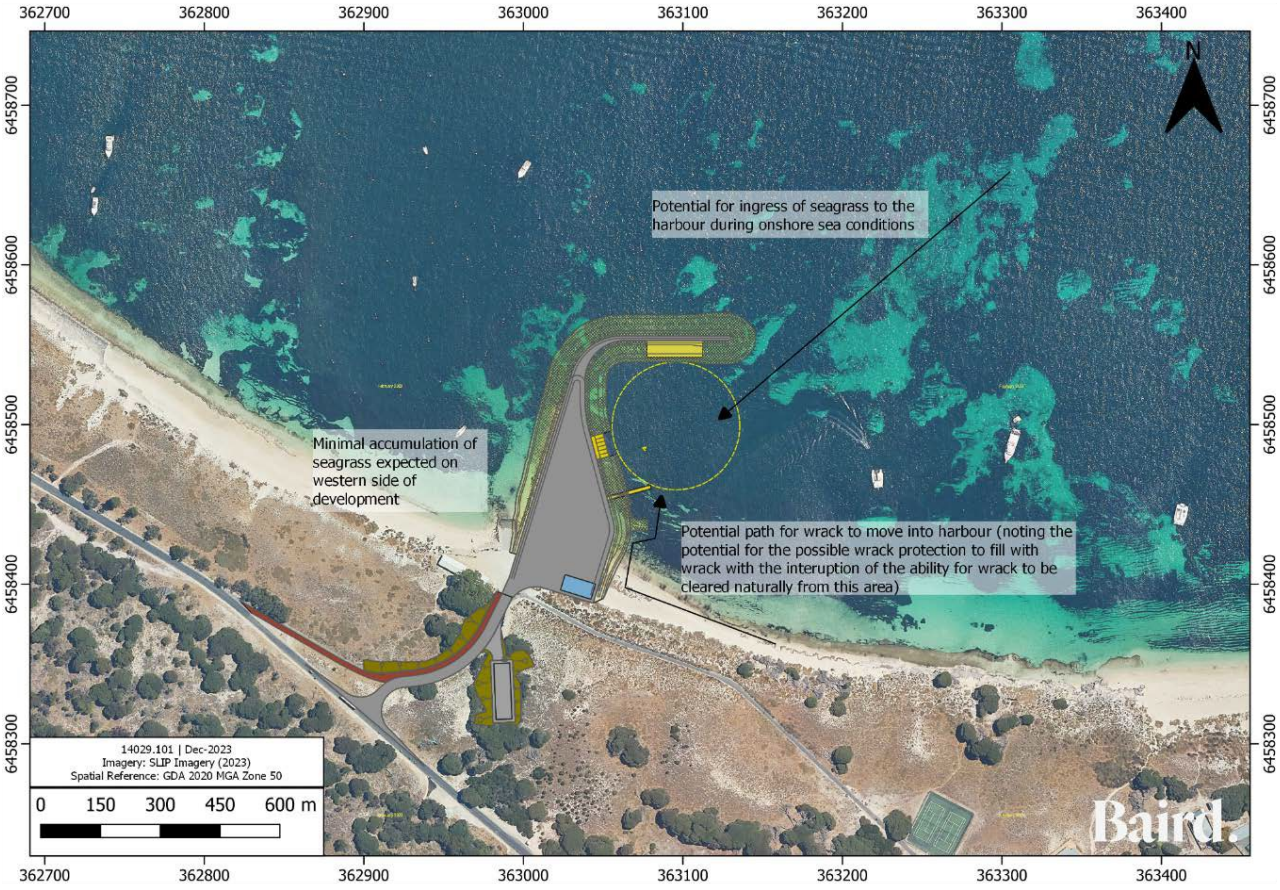


Figure 23: Potential wrack dynamic associated with the proposal

Plate 11: Existing wrack accumulation on the eastern side of the Army Groyne looking seaward (top, mid) and looking landward (bottom) (Baird, 2025a)

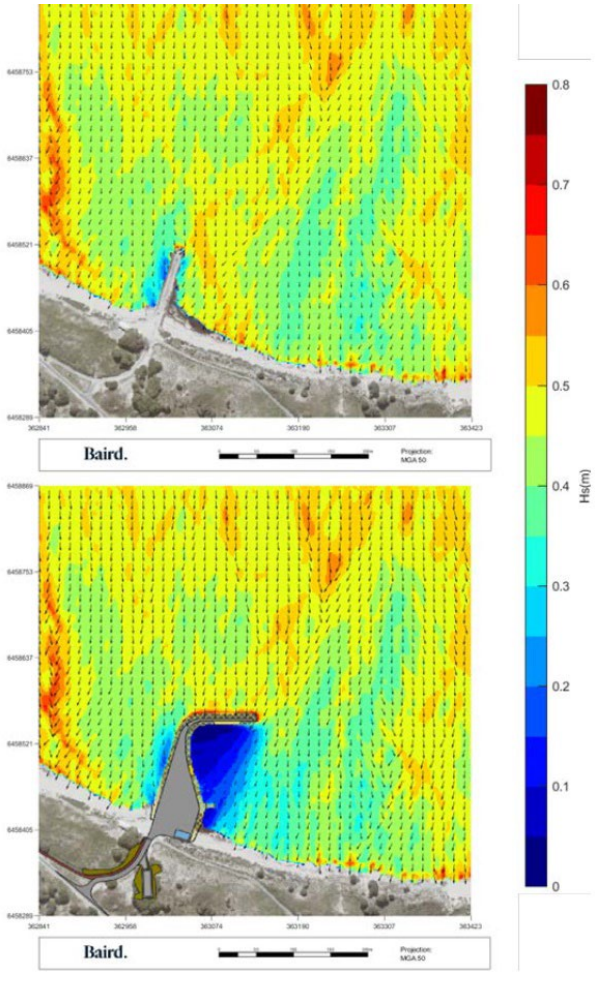
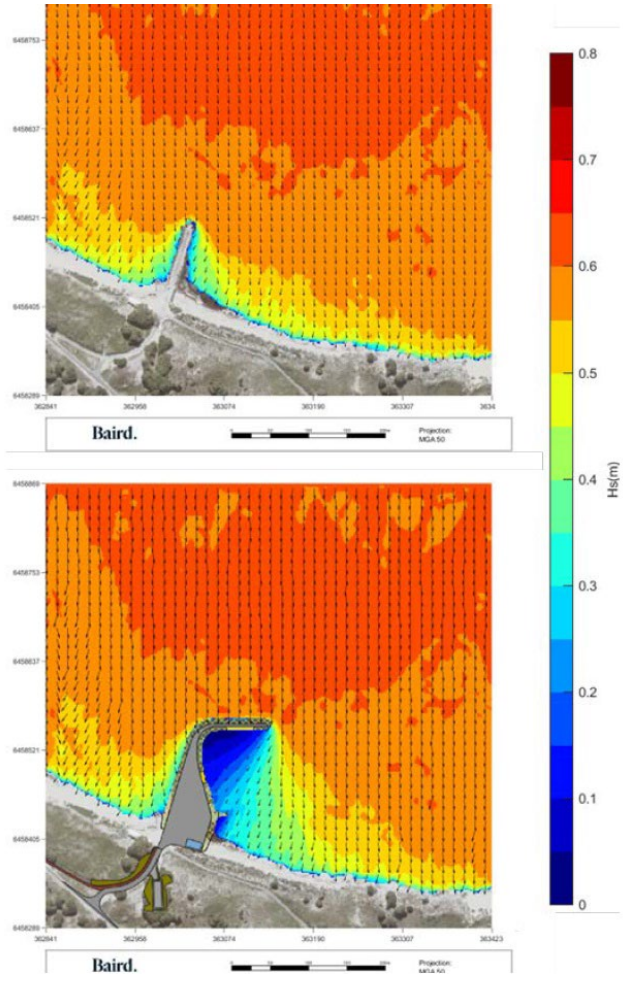
8.5.1.2 Reduction of wave energy in lee of structures

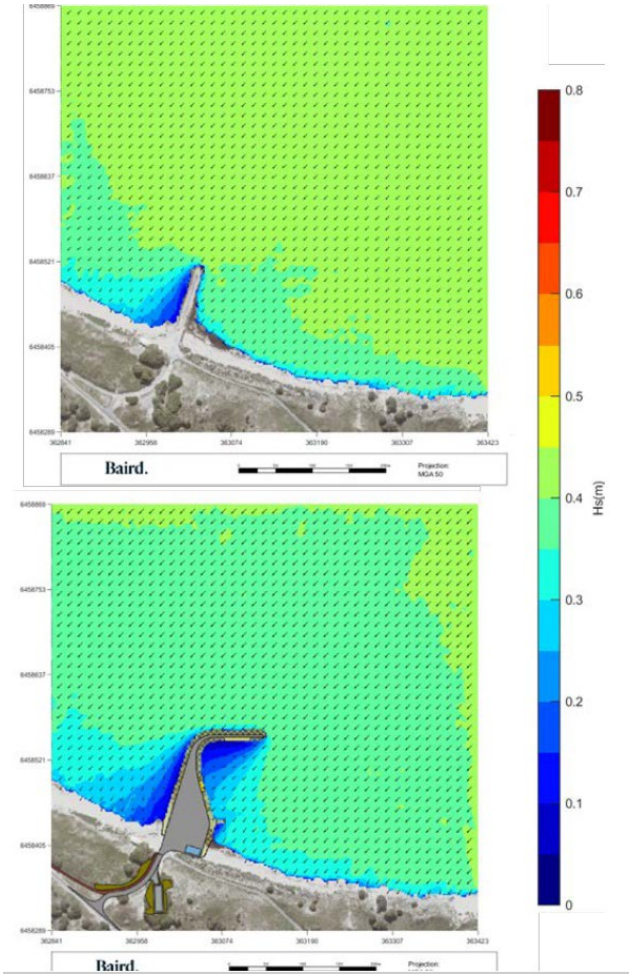
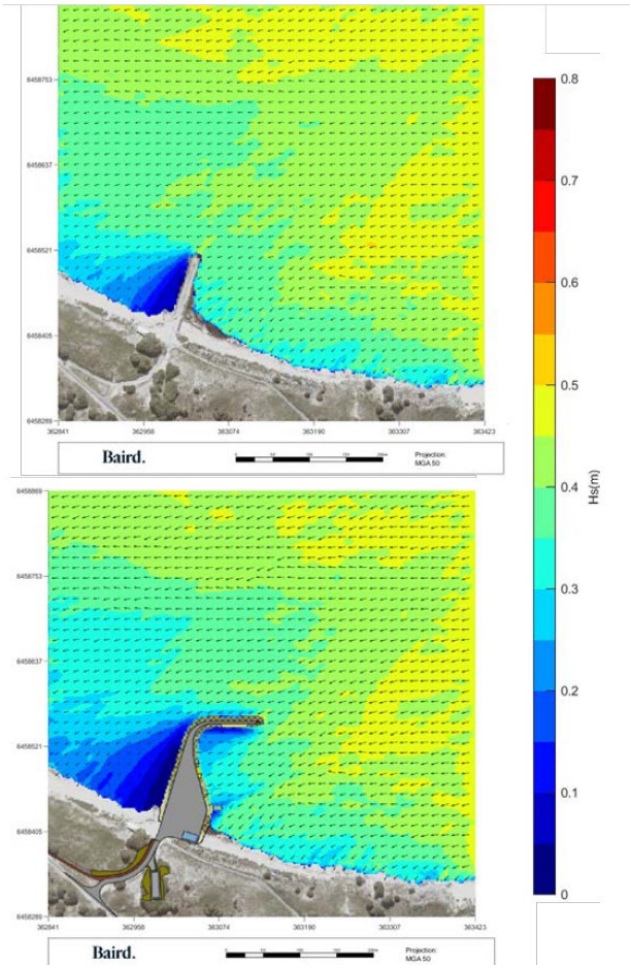
Baird plotted a number of different wave scenarios showing the change in the wave impacts with and without the proposed wharf (Table 38). Based on this, the following observations of changes to the wave impacts with and without the structures in place have been made (Baird, 2025a):

- The wave shadowing seen at the shoreline on the western side of the wharf is minimal, with a difference of <0.1 m in each wave case when compared to the existing condition. This is due to the impact that the existing Army Groyne structure has on waves on its western side when arriving at the structure from the predominant directions experienced at this location (i.e. from the northern to eastern sector).
- The greatest reduction in wave height, when compared to the existing conditions, is seen within the harbour basin area. Although, some reduction in wave height along the shoreline on the eastern side of the wharf is also evident, with wave shadowing increasing up to 0.4 m a short distance to the east from the wharf structure. This is most prominent, and has the greatest spatial impact, in the northerly wave cases.
- The wave shadowing seen within the harbour structure (most prominent with the northerly wave condition cases) creates a reduction between 0.1 m and 0.4 m across the scenarios considered, with the expectation that some wave direction conditions could produce a reduction in wave climate of up to 0.4 m within the harbour basin.

Overall, the main changes in wave energy as a result of the proposed wharf is the reduction in wave height (when compared to the existing conditions) within the harbour basin area and some reduction in wave height along the shoreline on the western side of the wharf.

Table 38: Wave scenarios showing the change in the wave impacts with and without the proposed wharf

Northern swell event wave plots showing wave conditions at the Army Groyne (top) and at the proposed barge landing facility (bottom)	Northern wind sea event wave plots showing wave conditions at the Army Groyne (top) and at the proposed barge landing facility (bottom)
	

North-eastern wind sea event wave plots showing wave conditions at the Army Groyne (top) and at the proposed barge landing facility (bottom)	Eastern wind sea event wave plots showing wave conditions at the Army Groyne (top) and at the proposed barge landing facility (top right)
	

8.5.1.3 Reflection of waves off structures

An assessment of wave penetration into the harbour basin has been undertaken by Baird, the analysis indicates that the wave conditions are reduced by the proposed wharf structure for waves approaching from the north and northeast, which are the dominant wave conditions at the location. The outcomes of the assessment are summarised below:

- Waves approach the site from the north for approximately 50% of the year. The analysis of diffracted wave conditions indicate that the barge landing location is well sheltered from swell wave conditions that arrive from the north. The breakwater is effective at reducing the wave conditions at the barge ramp to approximately 40% of the incoming wave conditions, with the diffracted swell wave arriving at the stern of the vessel.
- Wind sea conditions arrive at the site from the northeast for approximately 30% of the year. These wave conditions cover waves that have wave periods of typically less than 4 seconds and are generated by local wind conditions. The assessment identified that the wharf structure reduces the incident waves by approximately 30%.
- Wave conditions from the east represent a small proportion of the annual sea state, at approximately 2% of the yearly record. The proposed wharf does not provide protection from waves from this direction and it is assumed these conditions would reach the barge ramp unchanged. The waves will approach the barge ramp approximately in line with the vessel stern at 0.44 m to 0.5 m significant wave height. It is noted these conditions are infrequent over the course of the annual record in the measured data and are concentrated in the winter months.

The impact on wave conditions outside of the proposed wharf structure was determined to be minimal by Baird, with decreases in wave height being the main observation across each of the cases modelled. No detrimental increase in wave height caused by reflections from the breakwater structure is seen at the moorings managed by RIA (Baird, 2025a).

8.6 Mitigation

Table 39 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of coastal processes to address the key potential impacts.

Table 39: Application of mitigation hierarchy to coastal processes

Potential impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Interruption of longshore currents	Direct	Avoid	The Army Groyne creates an existing barrier to longshore sediment transport. Therefore, as the proposed wharf will block longshore sediment transport to a similar degree to the existing Army Groyne, the proposal is not anticipated to result in a significant change in longshore sediment transport within South Thomson Bay and significant impacts have been avoided.	**Sediment accretion and seagrass accumulating on the eastern side of the wharf.** Due to the presence of the existing Army Groyne, changes to longshore currents due to the proposed wharf are not considered likely to be significant. Any accumulation volume of wrack and the reshaping of the shoreline will be monitored and maintained as outlined in the OEMP.
		Minimise	• The proposed wharf structure has been subject to coastal processes modelling. • Monitoring of shoreline accretion and seagrass accumulation on the eastern side of the wharf will be undertaken as outlined in the OEMP (Appendix Q) and (CHRMAP) (Baird 2025) (Appendix W). As outlined in the CHRMAP (Baird 2025), a dedicated monitoring program will be implemented, particularly on the shoreline east of the development, to support the management of wrack and sediment. It is proposed that this monitoring starts pre construction and be continued through the construction phase and into the operational phase. • The requirement for wrack removal will be determined by the annual monitoring outlined in the CHRMAP (Baird 2025) and OEMP. If required, wrack removal will be undertaken through mechanical means (excavator) along the eastern edge of the breakwater. Based on the assessment undertaken by Baird, the volume of wrack is likely to peak in between December and March. Disposal of wrack will occur either onshore or offshore, depending on seasonal conditions. If disposal occurs offshore in commonwealth waters, relevant licenses will be applied for as discussed in Section 14.3.4. • If monitoring of sediment accretion identifies the requirement for post development management of sedimentation, this will be undertaken via mechanical means (excavator) from the shoreline. The analysis undertaken by Baird (2025) indicates that the peak volume will occur in late summer (February / March). The removed sediment should be placed onto shorelines east of Thomson Bay between Army Groyne and Philip Point to mimic natural processes. • Implementation of the South Thomson Bay Barge Development CHRMAP (Baird 2025).	
		Rehabilitate	Depending on the accumulation volume of wrack and the reshaping of the shoreline towards the protection nib on the eastern side of the wharf, the above maintenance and monitoring activities may need to be actioned (Baird, 2025a).	
		Offset	Coastal processes offsets are not considered applicable to the proposal.	
Reduction of wave energy in lee of structures	Direct	Avoid	• Impacts on coastal process from marine structures cannot be completely avoided due to the nature of the proposal. • Overall, the main changes in wave energy as a result of the proposed wharf is the reduction in wave height (when compared to the existing conditions) within the harbour basin area and some reduction in wave height along the shoreline on the western side of the wharf.	**A reduction of wave energy in lee of the proposed wharf.** This residual impact is not considered likely to have a significant impact on surrounding coastal process and the marine environment.
		Minimise	• The proposed wharf structure has been subject to coastal processes modelling. This modelling identified that changes are likely to be limited to: – The reduction in wave height (when compared to the existing conditions) within the harbour basin area – A small reduction in wave height along the shoreline on the western side of the wharf.	

			• As the vessels manoeuvre into or away from the facility within the turning circle, the waves would be 90 degrees to the vessel and further investigation into potential implications of this on the barge will be investigated as part of future detailed design. • Implementation of the South Thomson Bay Barge Development CHRMAP (Baird 2025).	
		Rehabilitate	Rehabilitation activities due to a reduction in wave energy is not considered applicable.	
		Offset	Coastal processes offsets are not considered applicable to the proposal.	
Reflection of waves off structures	Direct	Avoid	Impacts on coastal process from marine structures cannot be completely avoided due to the nature of the proposal.	**No residual impacts expected.**
		Minimise	The proposed wharf structure has been subject to coastal processes modelling and the impact on wave conditions outside of the proposed wharf structure was determined to be minimal by Baird (2024).	
		Rehabilitate	Rehabilitation activities due to a reduction in wave energy is not considered applicable.	
		Offset	Coastal processes offsets are not considered applicable to the proposal.	

8.7 Assessment and significance of residual impact

Following the application of the mitigation hierarchy (Table 39), RPS considers that there are no significant residual impacts to coastal processes from the proposal. The residual impacts are limited to:

- Sediment accretion and wrack accumulating on the eastern side of the wharf
- A reduction of wave energy in lee of the wharf.

The residual impacts are not considered significant as discussed in Table 40.

Table 40: Consideration of the significance of the residual impacts on coastal processes

Matters for consideration	Response
The object and principles of the EP Act	A Coastal Processes Assessment (Baird, 2024a) (Appendix D) was undertaken to address the EPA's Coastal Processes objective and the principles of the EP Act have been specifically addressed in relation to the proposal (Table 26).
Values, sensitivity and quality of the environment which is likely to be impacted	A Coastal Processes Assessment (Baird, 2025a) was undertaken to support the proposal to determine the potential impacts from the proposal on coastal processes. • Due to the presence of the existing Army Groyne, changes to coastal processes due to the proposed wharf are not considered likely to be significant.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been addressed in this report. However, as construction activities are unlikely to result in impacts to coastal processes, only impacts from the operational phase has been addressed in Sections 8.5 to 8.7.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	Baird (2025) undertook an assessment to estimate the extent of sand and wrack which may accumulate against the structure, as summarised below: • The present mechanism for the wrack to be naturally cleared from the eastern side of the groyne in the autumn months will be reduced once the proposed barge landing development has been constructed due to the hooked shape of the wharf. The predicted reduction in wave energy within the structure and at the shore is expected to result in continual build-up of wrack on the east side of the structure and within the dredged area. Baird estimates that the future volume of wrack which may accumulate on the eastern side of the groyne will be 1,600 m^3 per annum. Dredging and removal of this built up wrack material may be required every 2 to 5 years. • Baird (2025) estimated that the average sediment volume above the mean sea level (that which can be easily managed by land-based dredging methods) that is moving to the area on the east side of the groyne from winter to the summer peak is 800 m^3. Future projected volumes moving west under longshore sediment transport are not expected to be affected by the proposed wharf structure. The reduced wave energy at the shore is expected to result in continual build-up of sediment on the east side groyne over subsequent summers if no management action is undertaken. The OEMP (Appendix Q) and CHRMAP (Baird 2025) (Appendix W) outlines the proposed monitoring and maintenance measures to address this accumulation. Due to the presence of the existing Army Groyne, changes to coastal processes due to the proposed wharf are not considered likely to be significant. Therefore, residual impacts from the proposal are limited to: • Sediment accretion and wrack accumulating on the eastern side of the wharf • A reduction of wave energy in lee of structures.
Resilience of the environment	The majority of longshore sediment transport is currently blocked by the existing Army Groyne, and the proposed wharf will block longshore sediment transport to a similar degree (Baird, 2025a). As there are no significant changes to coastal processes, the coastal environment will not need to be resilient to changes resulting from the proposal.

Matters for consideration	Response
Consequence of the application of the mitigation hierarchy to the proposal.	Only minor changes to coastal process are predicted and these will be constrained to South Thomson Bay, in the immediate locale of the proposal. RPS considers that the residual impacts to coastal processes listed below are not significant: • Sediment accretion and wrack accumulating on the eastern side of the wharf • A reduction of wave energy in lee of structures.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment has been based on a Coastal Processes Assessment (Baird, 2025a) which was peer reviewed by RPS to confirm that the modelling and assessment was fit for purposes. As such, the prediction of the residual impacts has been completed with a high level of confidence.
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

8.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to coastal processes are:

- No increase in wrack or sediment accumulation or beach erosion above natural levels on nearby beaches within South Thomson Bay which will result in a reduction in social amenity and recreational values (including odour).
- No increase in wrack or sediment accumulation or beach erosion on nearby beaches within South Thomson Bay which will result in loss of roosting habitat for seabirds and shorebirds.
- No increase in wrack or sediment accumulation or beach erosion on nearby beaches within South Thomson Bay beaches which will result in a reduction of the extent of BCH outside of the development envelope.

Based on the outcomes of the Coastal Processes Assessment (Baird, 2025a), it is considered that the implementation of the proposal will successfully meet the EPA's objective for coastal processes (i.e. to maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected).

Adaptive management measures will be implemented in accordance with the OEMP to ensure residual impacts are not significant and that the environmental outcomes are met.

9 MARINE ENVIRONMENTAL QUALITY

9.1 EPA objective

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

9.2 Policy and guidance

The proposal will comply with applicable guidance developed by the EPA to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process.

Table 41 lists relevant EPA guidance, other state and Commonwealth policy documents, and provides consideration for how these documents informed the proposal.

Table 41: Relevant policy and guidance; marine environmental quality

Policy and guidance	Consideration
Environmental Factor Guideline: Marine Environmental Quality (EPA, 2016e)	The environmental factor guideline identifies the environmental values associated with marine environmental quality (i.e. ecosystem health, fishing and aquaculture, recreation and aesthetics, industrial water supply and cultural and spiritual) and their significance, identifies the level of ecological protection requirements and identifies development activities that have the potential to impact on marine environmental quality. Marine environmental quality studies undertaken to support the proposal include: • South Thomson Barge Landing Development; Dredge Plume Modelling Assessment (Baird, 2025b) (Appendix F) • Rottnest Island Army Jetty Dredging; SAP Implementation report (RPS, 2020) (Appendix H) • Baseline marine water quality sampling undertaken by RIA (Appendix G).
Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016f)	Changes in marine environmental quality have the potential to impact benthic communities and habitats. Potential impacts to benthic communities and habitats from the proposal are addressed in this Section (Section 9) and Section 7; Benthic communities and habitats.
Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (EPA, 2021a)	The technical guidance provides the general approach for describing impacts from dredging proposals, generating predictions, describing impact zones and integrating predictions with monitoring and management requirements which has been applied to the proposal. As outlined in Section 2, dredging activities will be undertaken during the construction phase of the proposal. The following has been undertaken to support the project and assess potential impacts from the proposed dredging activities: • South Thomson Barge Landing Development; Dredge Plume Modelling Assessment (Baird, 2025b) (Appendix F) • Peer Review of Dredge Plume Modelling and Coastal Processes Reports (RPS, 2024c) (Appendix E) • Dredging Environmental Monitoring and Management Plan (02 Environment, 2025) (Appendix O). During operations, maintenance dredging (of previously dredged areas) may also be undertaken (as a contingency / as required) consistent with the document Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016).
Technical Guidance: Protecting the Quality of Western Australia's Marine Environment (EPA, 2016g)	The technical guidance provides the environmental quality management frameworks for protecting the environmental values associated with marine environmental quality (i.e. ecosystem health, fishing and aquaculture, recreation and aesthetics, industrial water supply and cultural and spiritual) and provides the approach to setting levels of ecological protection and environmental quality criteria. The marine environmental quality technical studies prepared to inform the proposal have been underpinned by the technical guidance.

Policy and guidance	Consideration
Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand., 2018)	The guidelines provide authoritative guidance on the management of water quality for natural and semi-natural water resources in Australia to inform impact predictions and assessments. The assessment of marine environmental quality undertaken to inform the proposal acknowledges and follows the guidelines' criteria and trigger values where applicable.
National Assessment Guidelines for Dredging (Australian Government, 2009)	The guidelines set out the framework for the environmental impact assessment and permitting for the ocean disposal of dredged material. As no dredged material is proposed for disposal at sea, these guidelines are not applicable to the proposal and no Commonwealth *Environment Protection (Sea Dumping) Act 1981* permit is required. This is discussed further in Section 14.3.4.
Perth's Coastal Waters, Environmental Values and Objectives (EPA, 2000)	The guidelines identify environmental values and environmental quality objectives for Perth's coastal water. Much of the information set out in this document has been incorporated into / superseded by the EPA's Marine Environmental Quality factor and technical guidance. The environmental quality criteria and trigger values for the proposal have considered this document.
State Water Quality Management Strategy No.2, Implementation Plan: Status Report (Government of Western Australia, 2004)	The plan provides the overarching framework to inform the implementation of future water quality management plans. The following management plans have been prepared to broadly align with Government of Western Australia (2004): • Dredging Environmental Monitoring and Management Plan (02 Environment, 2025) (Appendix O) • Construction Environmental Management Plan (Emerge, 2025a) (Appendix P) • Operational Environmental Management Plan (Emerge, 2025b) (Appendix Q).
Background quality for coastal marine waters of Perth, Western Australia (Department of Environment, 2004)	This guidance details the findings of water quality surveys undertaken in Perth's coastal waters in 2003 to determine dissolved concentrations of a range of contaminants in the marine nearshore environments. It provides a broad overview of contaminant concentrations and ecological protection levels the findings of which are of relevance to the proposal.

9.3 Environmental investigations

Baseline marine water quality and sediment monitoring has been undertaken to support the proposal as summarised below:

- Rottnest Island Authority has undertaken baseline water quality monitoring in November and December 2023 and January 2024 (Appendix G).
- Sediment sampling was undertaken in November 2019 as part of the Rottnest Island Army Jetty Dredging; SAP Implementation report (RPS, 2020) (Appendix H).

These investigations are discussed in Sections 9.3.1 and 9.3.2. In addition to this, an unexploded ordnance (UXO) survey was conducted. The presence/absence of UXOs is discussed further in Section 13, Social surroundings.

9.3.1 Water quality monitoring

The baseline water quality monitoring locations have been situated within the ZoHI, ZoMI and ZoI as depicted in Figure 24 and summarised below:

- ST-01 is located within the ZoHI.
- ST-02 is located within the ZoMI
- ST-03 is located outside eastern edge of the ZoMI and within ZoI.
- ST-04 is located outside western edge of the ZoMI and down-gradient of any disturbance from the Main Jetty.

- ST-05 is located at the eastern end of the ZoI.
- ST-06 is located outside the development envelope and zone of influence and provide background water quality levels.

Sampling was undertaken in December 2023 (suite A) and January 2024 (suite B). The two different suites of analytes that were collected are:

- **Suite A**: Metals, nutrients, total recoverable hydrocarbons (TRH), Benzene, toluene, ethylbenzene, xylenes (as BTEX), chlorophyll-a, major anions and cations, alkalinity and hardness, TSS, TDS, enterococci, *E. coli*, faecal coliforms, field parameters (temperature, pH, dissolved oxygen, electrical conductivity, salinity, turbidity, ORP, light attenuation coefficient/Secchi depth)
- **Suite B**: Chlorophyll-a, TSS, TDS, field parameters (temperature, pH, dissolved oxygen, electrical conductivity, salinity, turbidity, ORP, light attenuation coefficient/Secchi depth).

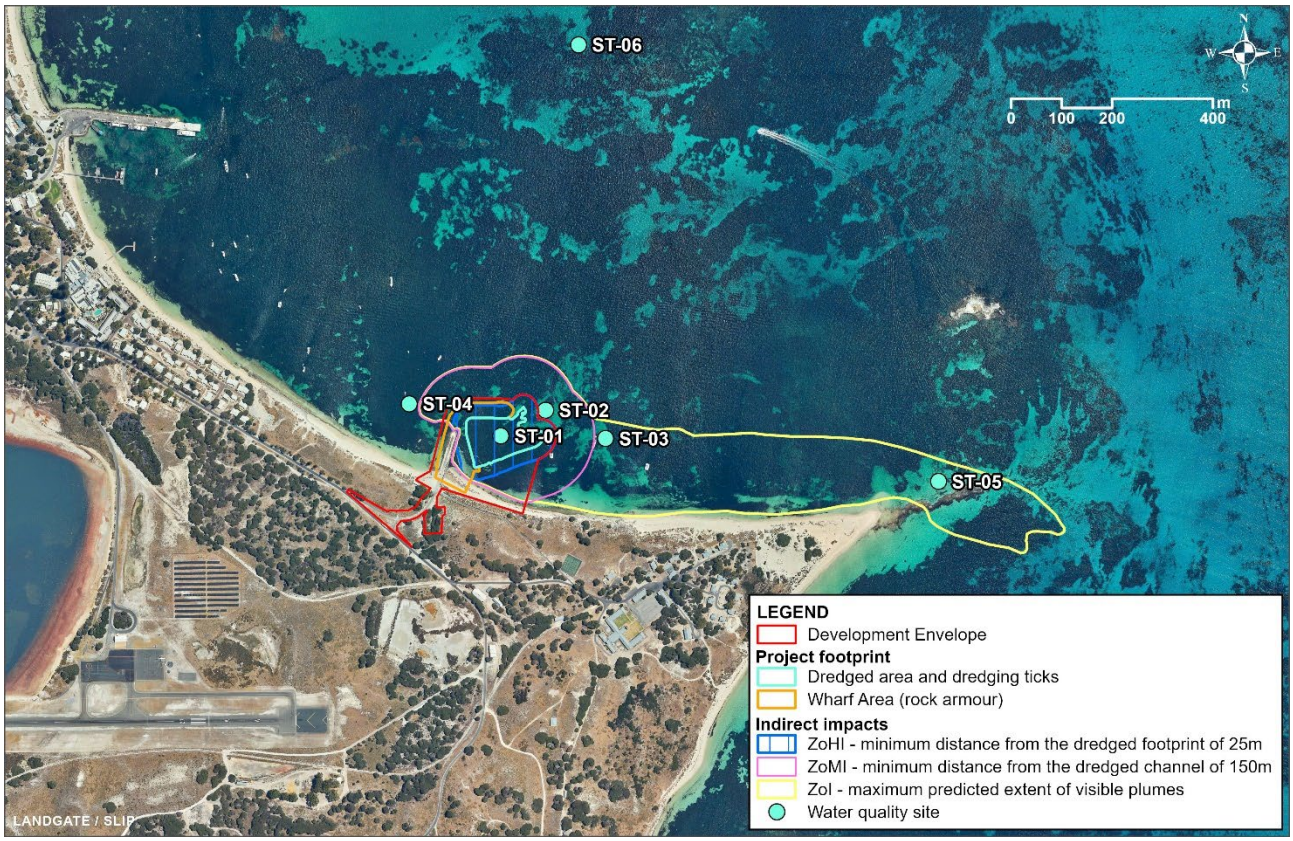


Figure 24: Baseline marine water quality monitoring locations

9.3.2 Sediment sampling

Sediments were sampled at seven locations across the proposed dredge area and ZoHI to a maximum depth of approximately 1.2 m or until refusal was reached. Sampling locations are presented in Figure 25.

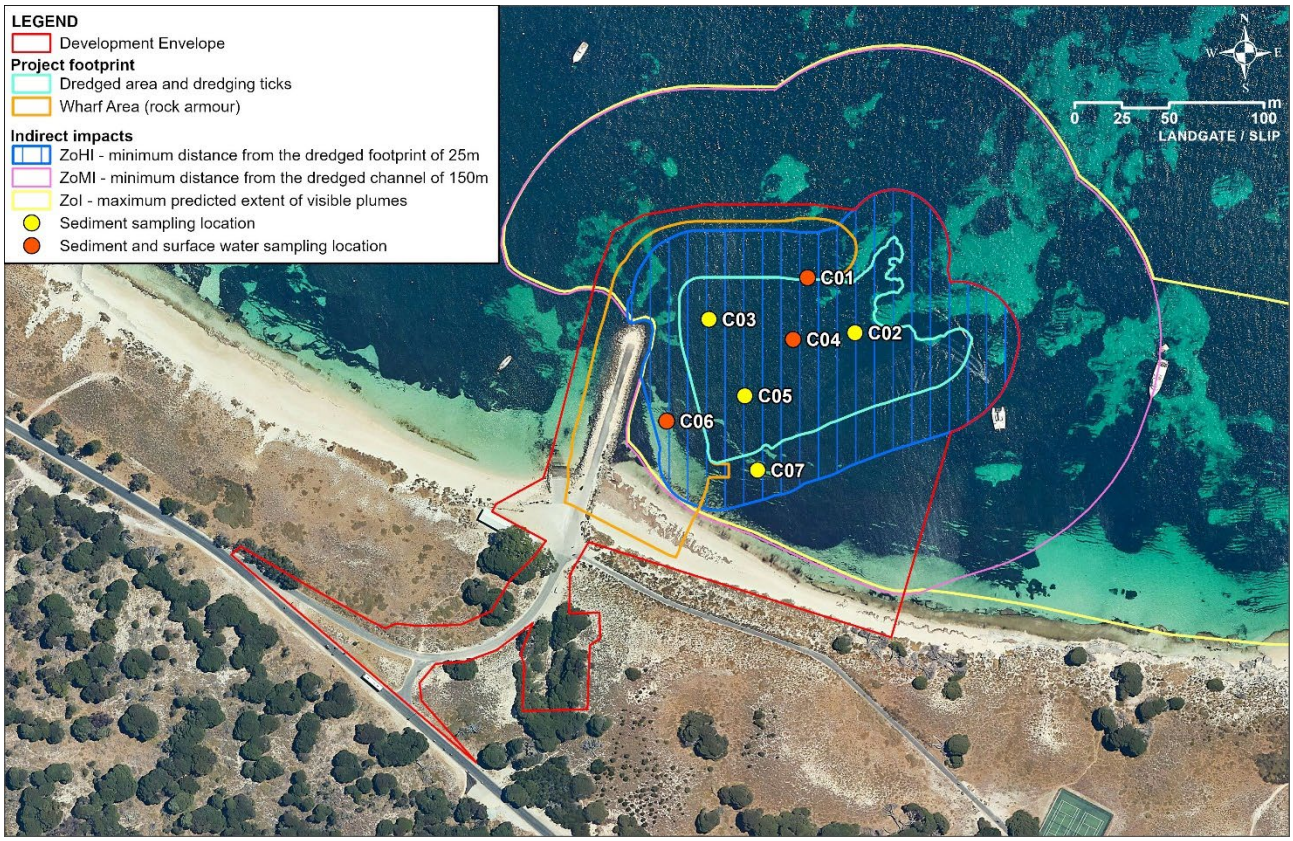


Figure 25: Baseline marine sediment sampling locations

9.4 Receiving environment

9.4.1 Historical land uses

With reference to the activities identified within the DWER *Contaminated Sites Management Series, Assessment and Management of Contaminated Sites* (DWER, 2014) the following surrounding site activities were considered potential sources of contamination:

- Port/wharf/dock activities and recreational boating activities have the potential to contaminate the marine environment through accidental fuel spills and boat sullage.
- Defence works and Defence establishments
- UXOs.

Based upon the aforementioned surrounding site activities, the following potential contaminants of concern have been identified:

- Metals (Ag, Cd, Se, Co, Sb, Cu, Pb, Zn, Cr, Ni, As, V, Mn and Hg)
- Organochlorine and organophosphate (OC/OP) pesticides
- TRH
- BTEX
- Polycyclic aromatic hydrocarbons (PAHs)
- Asbestos fibres
- Tributyl tin (TBT)
- Nutrients – total nitrogen, ammonia, nitrate, nitrite, total phosphorus and reactive phosphorus
- Per- and poly-fluoroalkyl substances (PFAS)

- Explosives.

Whilst PFAS is identified as a contaminant of potential concern due to historical land uses, the potential for significant use at the Army Groyne and nearby barracks is considered unlikely based upon the following (RPS, 2020):

- The island was essentially only used for training exercises after WWII.
- Given the location of the site (i.e. off the mainland) it is considered unlikely that significant training operations with firefighting foams would have been undertaken on the island.
- Firefighting training for Defence personal was undertaken at other facilities in Perth including Garden Island and RAAF Base Pearce, with army training likely undertaken at Campbell, Irwin and Leeuwin barracks and or the Bindoon training area.
- The barracks were handed over to the state in 1984, essentially ending military operations on the island
- Vessels were not allowed to dock at the jetty.
- Firefighting foams containing PFAS (PFOS and PFOA) entered use in the Department of Defence in the 1970s (Department of Defence, https://www.defence.gov.au/environment/pfas/).

9.4.2 Sediment quality

9.4.2.1 Screening values

Analysis of the sediment results was undertaken relevant to reclamation activities. The assessment concluded that from a contamination perspective, the sediments are suitable for reclamation activities, with all results below the following assessment criteria:

- Ecological investigation levels (EILs) and ecological screening levels (ESLs) for areas of ecological significance and public open space (NEPM, 2013)
- Health Investigation Levels for residential soil access (HIL-A) (CRC CARE, 2011).

9.4.2.2 Analytical results

All results were reported below relevant Default Guideline Value (DGV) and the sediments are not considered to pose a significant risk during dredging and are considered suitable for reclamation activities.

Analysis of the sediment sampling results and laboratory reporting is provided in Appendix H. A summary of the results is provided below:

- All metals were below relevant interim sediment quality guidelines. Where sediments did not exceed DGV guidelines and or no guidelines exist concentrations were relatively consistent across the dredge area.
- All sediment samples were reported less than the limit of reporting (LOR) (0.5 µgSn/kg) and thus complied with the DGV (5 µgSn/kg).
- All polycyclic aromatic hydrocarbons (PAH), organochlorine and organophosphate (OC/OP) pesticides and explosives were reported as below relevant LORs and thus below relevant DGV.
- All benzene, toluene, ethyl benzene and xylenes (BTEX) and total recoverable hydrocarbons (TRH) results were below the relevant LORs in all samples with the exception of minor TPH detects in two samples. Samples C06S01 and C07S03 complied with the DGV (280 mg/kg) for the sum C10-C36, with non-normalised concentrations of 5 and 7 mg/kg, respectively.
- With the exception of PFOS in three samples during November 2019 and one sample in March 2020, no other PFAS was reported above the LOR within any of the samples during either sampling event. However, the concentrations of PFOS were:
  - Only marginally above the LOR
  - An order of magnitude below the lowest screening criteria
  - Consistent during both sampling events.

- No guidelines for nutrients (phosphorus or nitrogen) exist in Western Australia. Concentrations were predominately consistent across the sampling area. Phosphorus was predominantly in total forms (i.e. non-reactive forms) and as such was bound up with the sediment. Nitrogen is also predominantly bound to sediments and in organic forms (i.e. Kjeldahl nitrogen). Ammonia was the dominant inorganic form of nitrogen however inorganic concentrations are significantly lower than organic forms of nitrogen.

9.4.3 Water quality

9.4.3.1 Screening values

To assist with monitoring of water quality, trigger values have been adopted from the following guidance documentation:

- *Assessment and Management of Contaminated Sites* (DWER, 2021)
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (WQA, 2024).

Trigger values used in Table 42 and Table 43 are colour coded to show where each trigger has been exceeded, using the following definitions:

- MWG-95; marine water guidelines for slightly–moderately disturbed lowland river systems, at the 95% species protection level
- MWG-99; marine water guidelines for high conservation/ecological value systems, at the 99% species protection level.

9.4.3.2 Analytical results

Comprehensive analysis was undertaken in December 2023 and January 2024 by a National Association of Testing Authorities accredited laboratory on water samples collected from South Thomson Bay, with sampling locations and analytes discussed in Section 9.3.1.

The laboratory reports are provided in Appendix G with the results presented in Table 42 and Table 43.

Table 42: Water quality within South Thomson Bay; metals

Parameter	Dissolved metals										
	Al	As	Cd	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Zn
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MWG-95	-	-	5.5	27	1.3	-	0.4	80	70	4.4	8.0
MWG-99	-	-	0.7	7.7	0.3	-	0.1	80	7.0	2.2	3.3
December 2023											
ST-01	---	1.6	<0.10	<1.0	<1.0	---	<0.05	<1.0	<1.0	<1.0	<1.0
ST-02	---	1.6	<0.10	9.6	<1.0	---	<0.05	<1.0	<1.0	<1.0	620
ST-03	---	1.8	<0.10	<1.0	<1.0	---	<0.05	<1.0	<1.0	<1.0	<1.0
ST-04	---	2.0	<0.10	<1.0	<1.0	---	<0.05	<1.0	<1.0	<1.0	11
ST-05	---	1.8	<0.10	<1.0	<1.0	---	<0.05	<1.0	<1.0	<1.0	<1.0
ST-06	---	2.0	<0.10	<1.0	<1.0	---	<0.05	<1.0	<1.0	<1.0	<1.0

- denotes no guideline, --- denotes not tested.

Table 43: Water quality within South Thomson Bay; other parameters

Parameter	TSS	Chl-a	FRP	TN	TKN	NOX-N	Thermotol. coliforms	Enterococci	E. coli
Units	mg/L	mg/L	mg /L	mg /L	mg /L	mg /L	cfu/mL	cfu/mL	cfu/mL
MWG-95	-	0.3	5	230	-	5	-	-	-
MWG-99	-	-	-	-	-	-	-	-	-
December 2023									
ST-01	<5.0	<1.0	<0.005	0.16	0.16	<0.005	1	1	<1
ST-02	<5.0	<1.0	<0.005	0.12	0.12	<0.005	<1	<1	<1
ST-03	<5.0	<1.0	<0.005	0.15	0.14	<0.005	<1	<1	<1
ST-04	<5.0	<1.0	<0.005	0.13	0.13	<0.005	1	<1	1
ST-05	<5.0	<1.0	<0.005	0.15	0.14	<0.005	<1	1	<1
ST-06	<5.0	<1.0	<0.005	0.15	0.15	<0.005	1	<1	<1
January 2024									
ST-01	<5.0	<1.0	---	---	---	---	---	---	---
ST-02	<5.0	<1.0	---	---	---	---	---	---	---
ST-03	<5.0	<1.0	---	---	---	---	---	---	---
ST-04	<5.0	<1.0	---	---	---	---	---	---	---
ST-05	<5.0	<1.0	---	---	---	---	---	---	---
ST-06	<5.0	<1.0	---	---	---	---	---	---	---

- denotes no guideline, --- denotes not tested

The majority of the analytes were below practical quantitation limits set by the laboratories and typically below the adopted screening levels, with the exceptions discussed as follows:

- Chromium concentrations marginally exceeded the MWG-99 (7.7 µg/L) at ST-02 (9.6 µg/L).
- Zinc concentrations exceeded both the MWG-95 (8.0 µg/L) and MWG-99 (3.3 µg/L) at ST-02 (620 µg/L) and ST-03 (11 µg/L).
- The chlorophyll-a levels were below the LOR for all samples, noting however that the LOR was above the screening levels.
- Whilst no screening levels were adopted for microbiological parameters or total dissolved solids, concentrations are considered low.

The elevated concentration of chromium and zinc at ST-02 are considered an anomaly, and either represent an analysis error or sampling error where fine sediment was introduced into the sample. The latter is considered unlikely as the TSS values indicate that the sample contained little sediment.

9.5 Potential environmental impacts

Table 44 provides the potential key impacts to marine environmental quality from the proposal.

Table 44: Potential impacts on marine environmental quality

Phase	Impact class	Works / operations	Potential impacts
Construction	Direct	• Dredging • Breakwater construction • Reclamation (decant from reclamation area) • Piling • Vessel operations.	**Increase in total suspended solids (TSS)** • Mobilisation of sediment during dredging activities, construction of the breakwater, reclamation and piling will result in a temporary increase in TSS within the following modelled areas: – ZoHI – ZoMI – ZoI.
	Indirect	• Dredging • Breakwater construction • Reclamation (decant from reclamation area) • Piling • Vessel operations.	**Temporary release of contaminants from marine sediment during dredging and reclamation activities** • The proposed dredging activities and resulting suspension of sediments have the potential to result in the temporary release of contaminants from sediments. **Increased risk of pollution incidents** • Accidental fuel spills to marine environment during construction resulting in hydrocarbon contamination of water, sediment and biota. **Increase in total suspended solids** • Temporary decease in light availability for benthic communities and habitats due to increased TSS.
Operation	Indirect	• Vessel operations • Maintenance dredging (potential contingency).	**Increase in total suspended solids** • Temporary increase in sedimentation • Temporary decease in light availability for benthic communities and habitats due to increased TSS. **Increased risk of pollution incidents** • Increased risk of pollution incidents from vessels and fuel storage facilities leading to degradation of marine environmental quality.

9.5.1 Assessment of impacts

9.5.1.1 Increase in total suspended solids

9.5.1.1.1 Predicted zones of impact

A dredge plume modelling assessment was undertaken by Baird (2025b) (Appendix F) to support the proposal. The dredge plume model simulated the dredge plume generation from the proposed dredging to determine the fate of fine sediments in suspension, as suspended sediment concentration (SSC) both spatially and vertically through the water column.

The calculation of the zones of impact defined by the dredge plume modelling determined nominal values of SSC that would have detrimental impact on local seagrass species. The calculated zones of impact were determined based on the complete winter dredging program and are shown in Figure 26. The zones of impact determined by Baird (2025b) and the predicted impacts on benthic communities and habitats are summarised below:

- **Zone of High Impact (ZoHI)** – The area where impacts on benthic communities or habitats are predicted to be irreversible. The term irreversible means ‘lacking a capacity to return or recover to a state resembling that prior to being impacted within a timeframe of five years or less’. The ZoHI encompasses an area of 1.37 ha. The majority of the ZoHI is located within the development envelope.
- **Zone of Moderate Impact (ZoMI)** – The area within which predicted impacts on benthic communities or habitats are recoverable within a period of five years following completion of the dredging activities. This zone abuts, and lies immediately outside of, the ZoHI. The ZoMI encompasses an area of 4.5 ha.
- **Zone of Influence (ZoI)** – The area within which changes in environmental quality associated with dredge plumes are predicted and anticipated during the dredging operations, but where these changes would not result in a detectible impact on benthic biota. At any point in time, the dredge plumes are likely to be restricted to a relatively small portion of the ZoI. The ZoI encompasses an area of 13.44 ha.

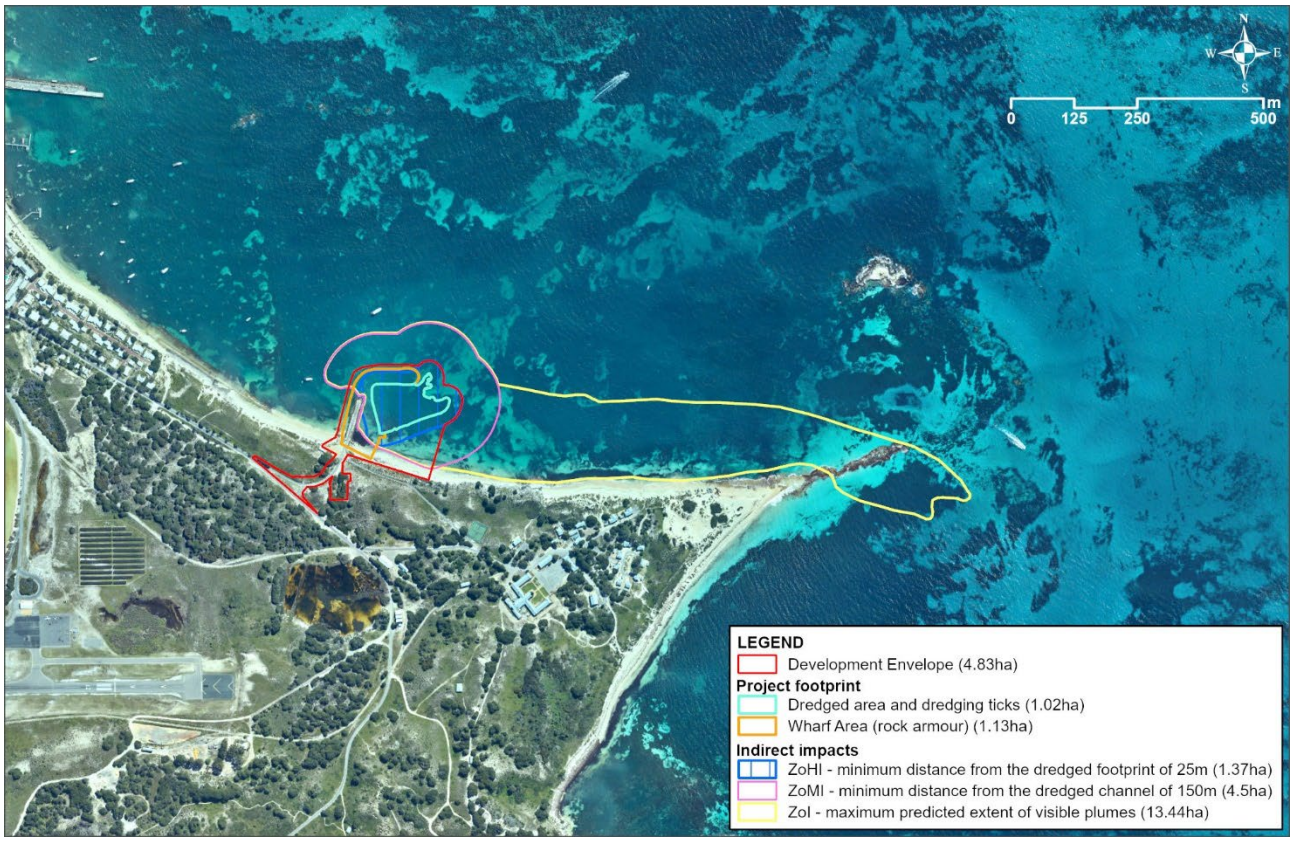


Figure 26: Zones of influence from dredging activities

9.5.1.1.2 Predicted plume behaviour

The overall current direction within South Thomson Bay trends from west to east, resulting in the modelled plume being generally directed east along South Thomson Bay, away from the existing Army Groyne, with occasional periods of direction change causing the plume to move west and around the Army Groyne. This is demonstrated in the spatial plots taken from specific points in time shown in Figure 27, with plots shown at three hourly timesteps from 18:00 on 26 June 2020 to 03:00 on 27 June 2020. These plots show:

- The plume being directed strongly to the east away from the Army Groyne (top left plot)
- The plume being directed less strongly away from the Army Groyne in the middle of a flood tide (top right plot)
- The plume being directed weakly to the west around the Army Groyne as the flood tide gets closer to its peak water level (bottom left plot)
- As the flood tide is close to its peak water level and remaining close to the point of discharge in the peak of a tidal cycle as the tide turns from flood to ebb (bottom right plot).

These plots indicate that the suspended sediment plume from the proposed dredging activities is predicted to be localised to the area of South Thomson Bay around the development envelope.

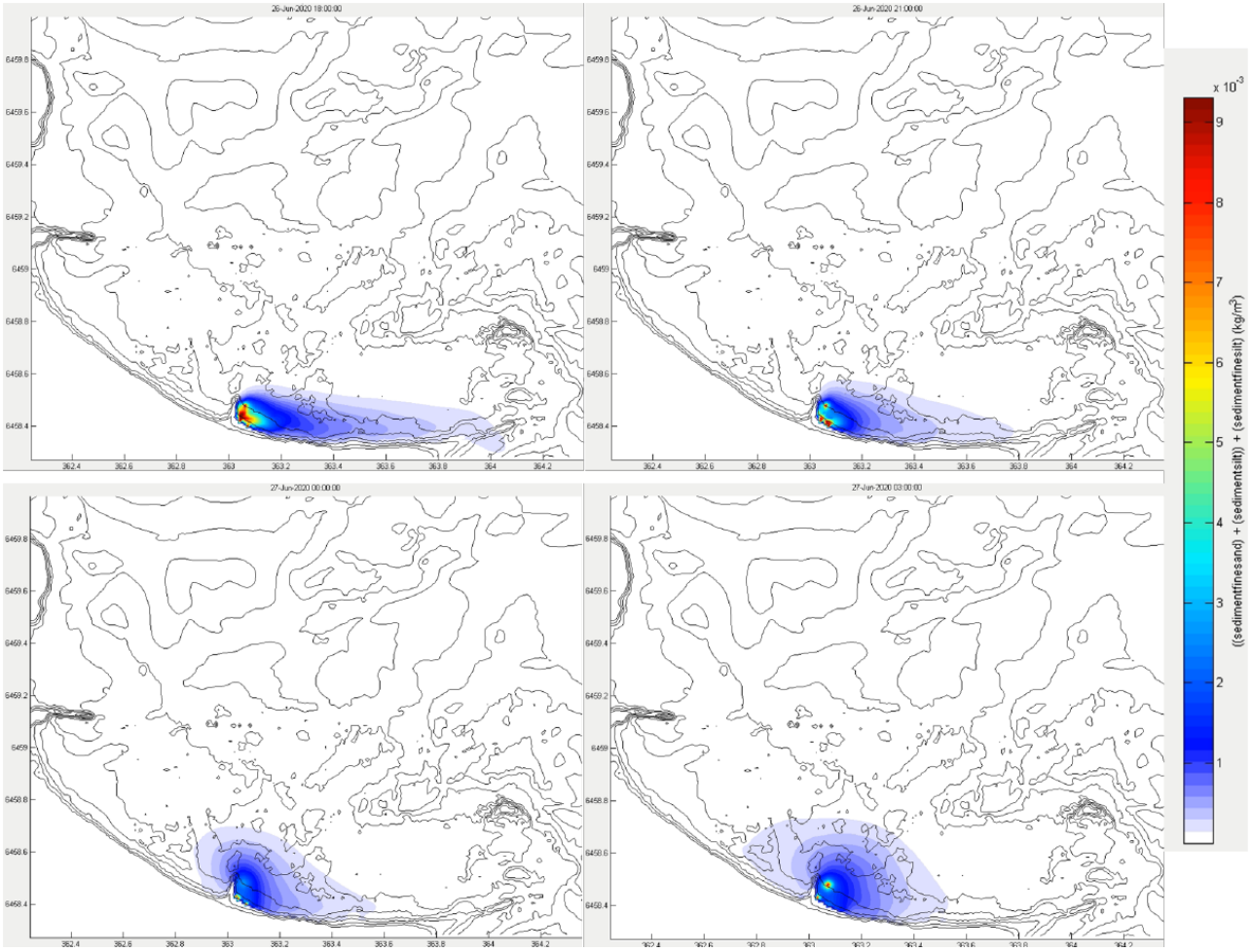
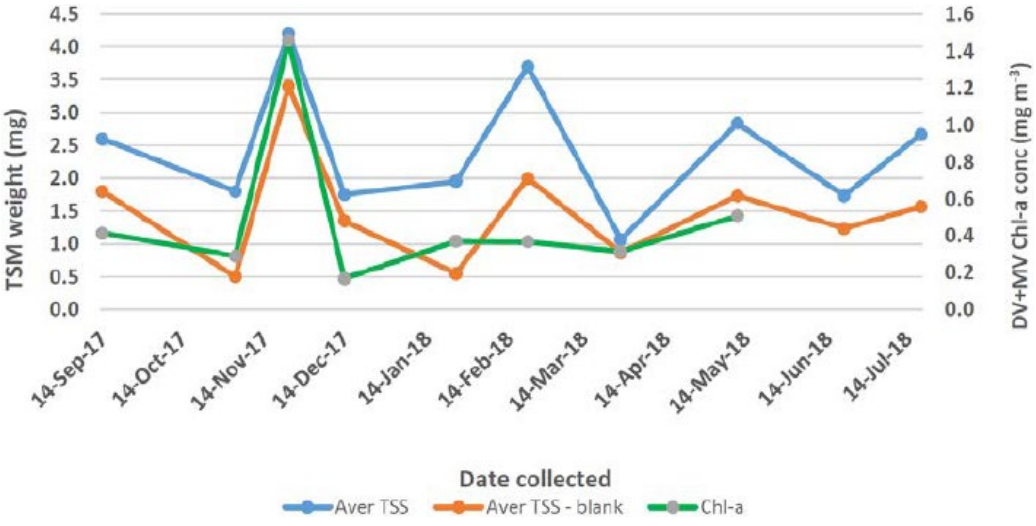


Figure 27: Spatial plots of the dredge plume model (Baird, 2025b)

9.5.1.1.3 Suspended sediment concentration

The dredge plume model simulations were executed with no background SSC and the model results represent excess above the adopted background SSC of 3 mg/L. Data from the Rottnest IMOS National Reference Station provides measured TSS offshore of Wadjemup / Rottnest Island (Graph 6). The TSS values measures ranged between 0.5 mg/L and 3.5 mg/L, indicating that the adopted background level of 3 mg/L is a conservative approach.



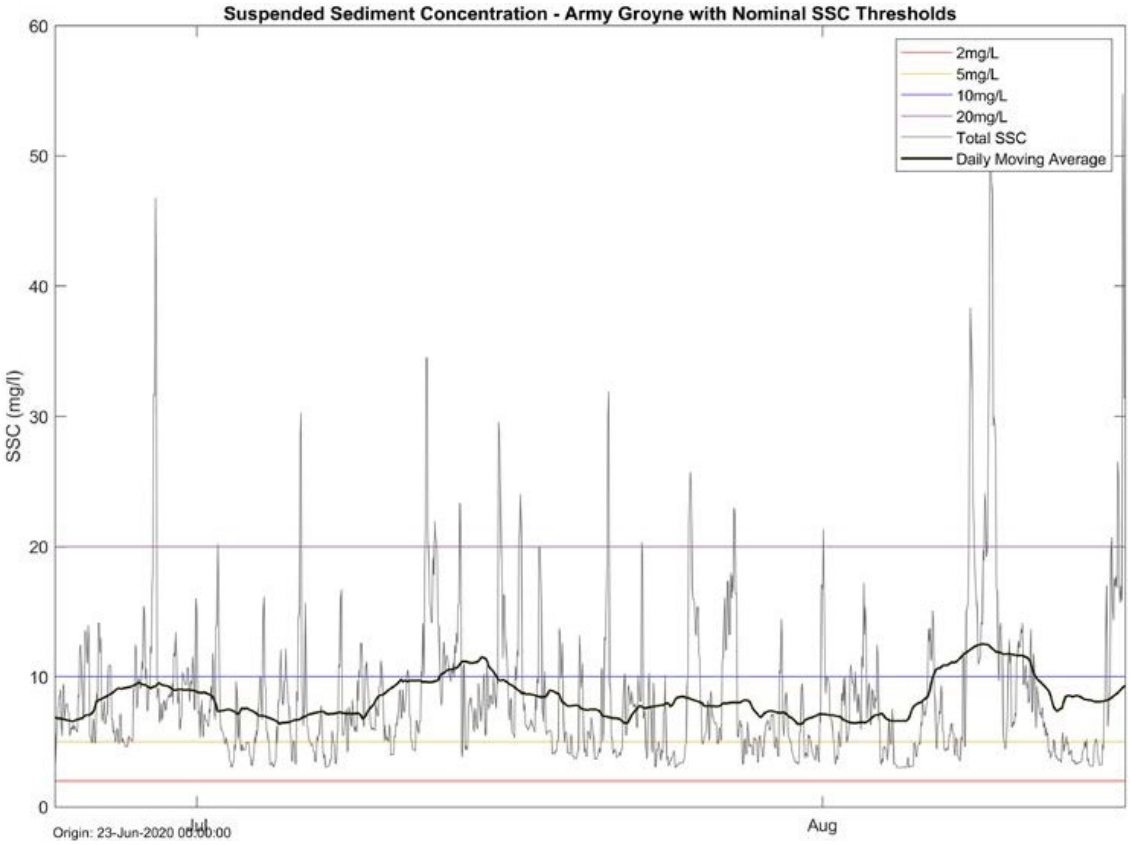
Graph 6: Average post-July 2017 TSM values with (orange line) and without (blue line) a data correction for the blank at Wadjemup / Rottnest Island between September 2017 and July 2018 (Baird, 2025b)

Examples of the analysis for winter of the total SSC and daily running mean SSC at the locations provided in Figure 28 against the following nominal thresholds adopted for the zones of impact are shown in Graphs 5 to 8.

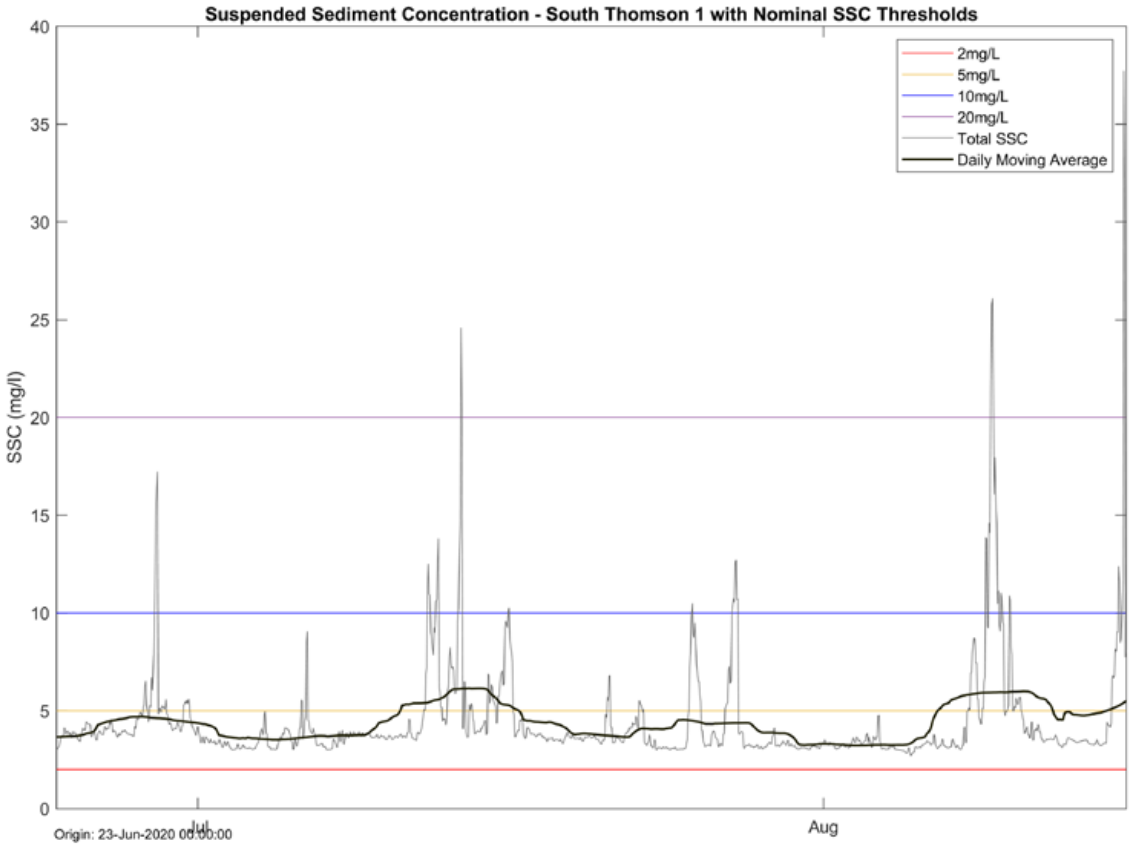
- ZoHI – where sedimentation/burial is >10 cm or 10,000 g/m^2
- ZoMI – where a TSS concentration of >10 mg/L was exceeded and sedimentation burial is 5–10 cm or 5,000–10,000 g/m^2
- ZoI – where a TSS concentration of >2 mg/L above background was exceeded (representing the maximum predicted extent of visible plumes).

Graph 7 demonstrates the relatively high level of SSC likely to be experienced at the dredge footprint, while Graph 8 indicates that there are likely to be occasional periods of exceedance of the nominal thresholds related to moderate risk (10 mg/L) and high risk (20 mg/L) at the South Thomson Bay 1 location (Figure 28). The Aquadopp profiler equipment location immediately north of the dredge footprint only experiences levels of SSC that would result in a visible sediment plume, but with no measurable impact on benthic communities and habitats.

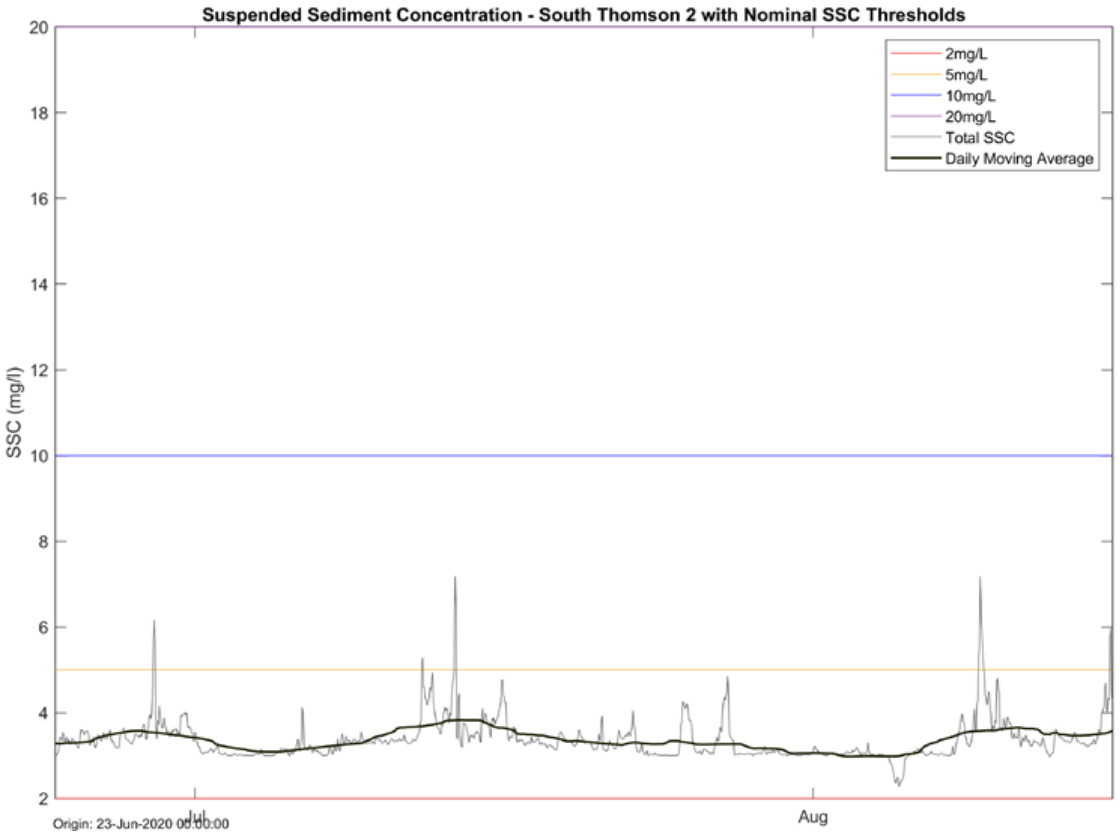
Figure 28: Locations where timeseries SSC data is presented (Baird, 2025b)



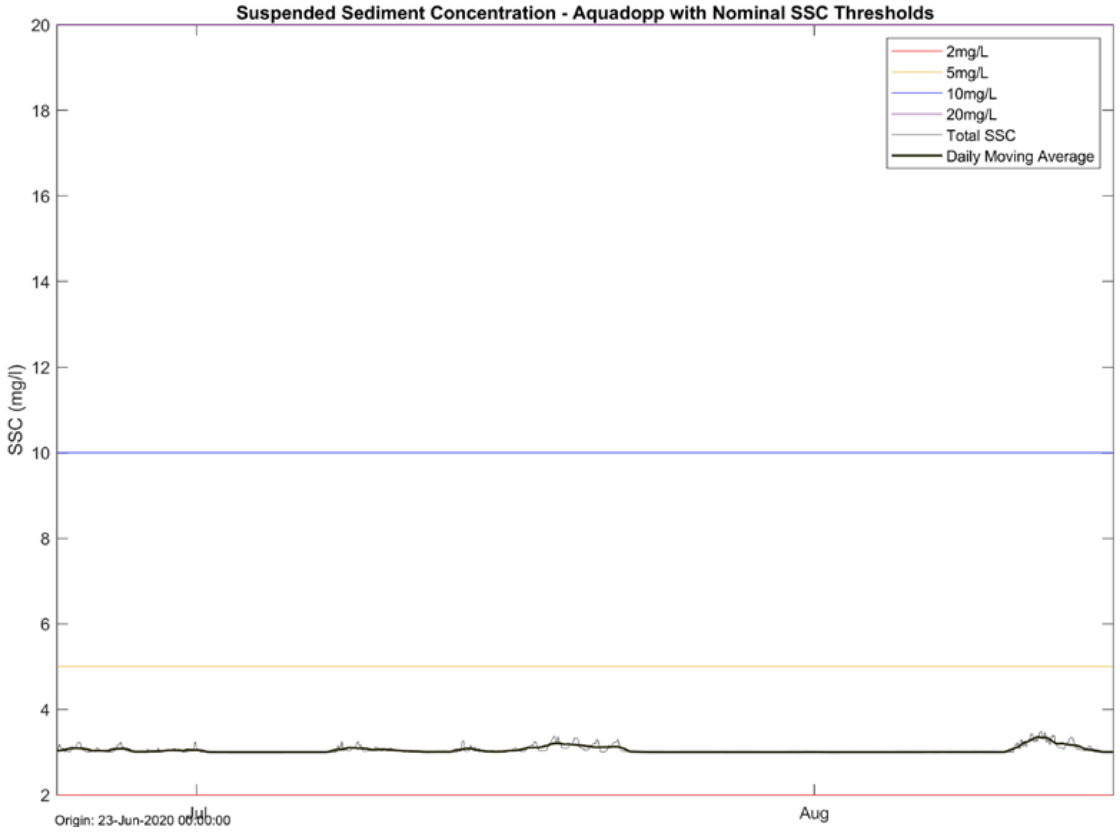
Graph 7: **Calculation of total SSC and daily mean values of modelled SSC analysed against nominal seagrass impact thresholds at the Army Groyne location (Baird, 2025b)**



Graph 8: **Calculation of total SSC and daily mean values of modelled SSC analysed against nominal seagrass impact thresholds at the South Thomson Bay 1 location. Analysis shown for the background SSC of 3 mg/L (Baird, 2025b)**



Graph 9: **Calculation of total SSC and daily mean values of modelled SSC analysed against nominal seagrass impact thresholds at the South Thomson Bay 2 location. Analysis shown for the background SSC of 3 mg/L (Baird, 2025b)**



Graph 10: **Calculation of total SSC and daily mean values of modelled SSC analysed against nominal seagrass impact thresholds at the Aquadopp location. Analysis shown for the background SSC of 3 mg/L (Baird, 2025b)**

9.5.1.1.4 Potential release of contaminants from sediments

The proposed dredging activities and resulting suspension of sediments have the potential to result in the temporary release of contaminants from sediments. However, as discussed in Section 9.4.2, baseline sediment results were below the following assessment criteria.

- EILs and ESLs for areas of ecological significance and public open space (NEPM, 2013)
- Health Investigation Levels for residential soil access (HIL-A) (CRC CARE, 2011).

As all results were below the Default Guideline Value, the sediments are not considered to pose a significant risk to ecological receptors and human health during dredging and reclamation activities.

9.5.1.2 Increased risk of pollution incidents

9.5.1.2.1 Vessel operations

Increased boat numbers during operation, and to lesser degree construction, of the proposal has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage.

An increase in vessels using South Thomson Bay is expected during the operational phase. Quantities and types of material that might enter the marine environment are limited to spills relating to these vessels. The magnitude of this impact is dependent on the quantities and nature of the spillage, the dilution and dispersal properties of the waters and the bioavailability of the contaminant to species.

9.5.1.2.2 Fuel storage

A fuel facility, including underground storage fuel storage is proposed as part of the proposal (Figure 29). There is a risk for fuel spills to occur during refuelling or from fuel storage facilities. Fuel spills from the fuel facility have the potential to impact marine environmental quality.

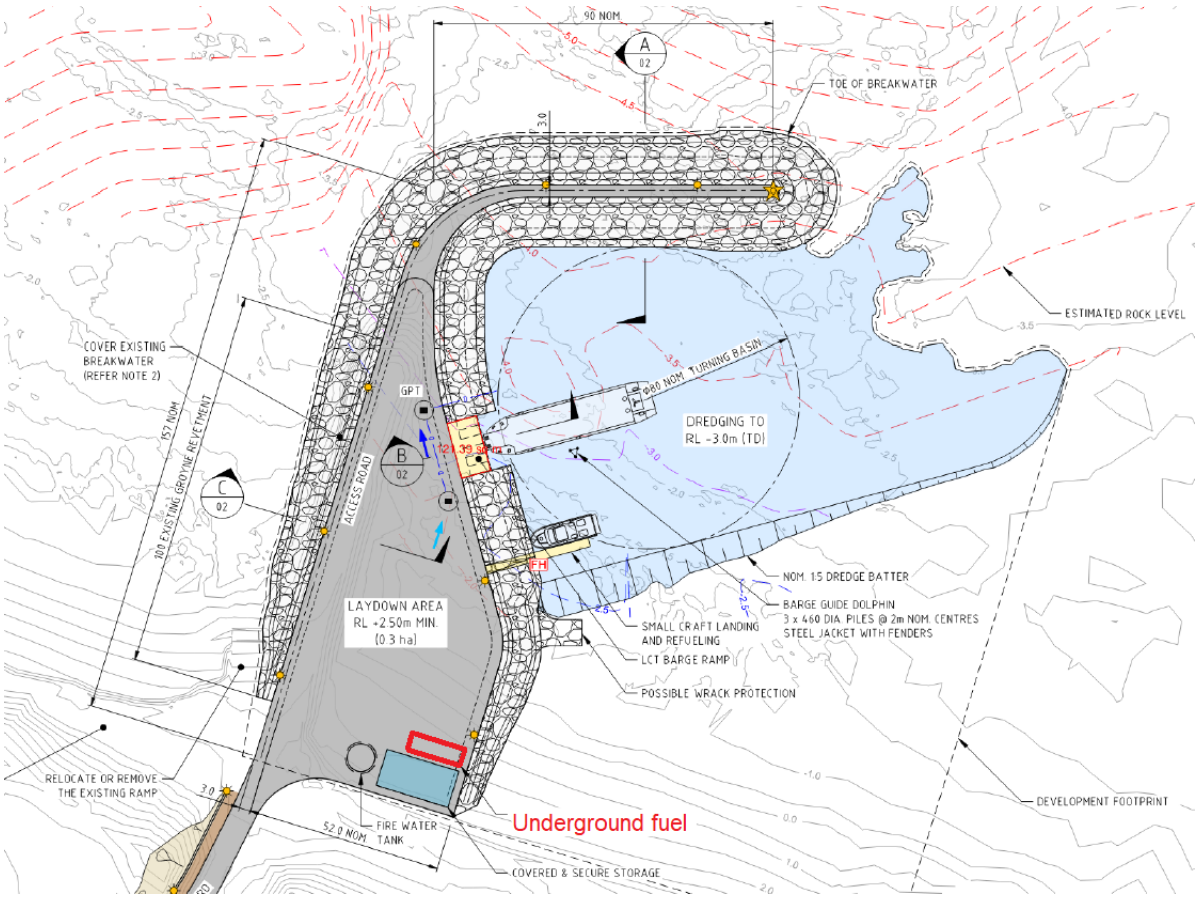


Figure 29: Location of underground fuel storage

9.6 Mitigation

Table 45 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of marine environmental quality to address the key potential impacts.

Table 45: Application of mitigation hierarchy to marine environmental quality

Potential impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Temporary increase in suspended sediments during construction and dredging activities.	Direct	Avoid	As dredging activities are a requirement for construction of the proposal, an increase in suspended sediments during construction cannot be avoided.	**A temporary increase in suspended sediments within the ZoI, ZoMI and ZoHI** Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address a temporary increase in TSS / turbidity during construction. Implementation of these management plans ensures that significant impacts to marine environmental quality outside the ZoMI and ZoHI from a temporary increase in suspended sediments are unlikely.
		Minimise	• RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3 • Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24 – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP. This program specifies that if the triggers are exceeded, then the following management actions will be implemented to ensure impacts to marine environmental quality do not extend past the modelled zone of influence: ○ If trigger 1 has been exceeded: • Investigate if trigger 2 has been exceeded for any monitoring sites • Sample again at the exceeded monitoring site and associated reference site each day until turbidity has decreased. ○ If trigger 2 has been exceeded: • Assess metocean and weather conditions • Investigate if dredging or disposal has been occurring and if that is likely to be attributable to the exceedance • Investigate results of the other parameters to determine if there is likely to be stress on the surrounding seagrass • Sample again at that monitoring site and associated reference site each day until turbidity has decreased. ○ If the trigger levels are exceeded (or indicate a progressive increase towards the trigger levels) then modifications to the dredging program are to be considered, and may include, but not necessarily be limited to the following actions. Modifications to the dredge program will continue until the trigger levels are no longer exceeded. If trigger level 2 is exceeded for two consecutive days, dredging will cease and Level 2 management actions, as outlined in the DEMMP, shall be implemented and dredging will only recommence after trigger level 1 is no longer exceeded. • Reactive benthic communities and habitats survey • Temporary pause to dredging activities (e.g. if exceedance appears to be due to factors other than dredging vessel movements, then pausing dredging activities will minimise cumulative effects) • Relocate the dredge (e.g. to an area of coarser sediment) • Reduce the dredge cut depth, rate of swing-speed and/or increase the dredge pump flow • Reduce disposal of material if the plume is coming from the reclamation area. – Implementation of the tiered management framework provided in the DEMMP – Use of silt curtains which will minimise the potential impacts associated with increased suspended sediments – The placement of geofabric (such as Texcel 1200R) textile weave along the bund wall will ensure that the placement of dredge spoil during reclamation works will not impact or increase the dredge plume zones.	
		Rehabilitate	Impacts to marine water quality from an increase in TSS within the ZoMI and ZoI will be temporary only.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	
Increased risk of pollution incidents from vessels and underground fuel storage leading to degradation of marine environmental quality	Indirect	Avoid	Construction and operation of the proposal includes vectors which have the potential to result in pollution incidents and risk of this impact cannot be avoided.	**No residual impacts expected** Implementation of the management and monitoring measures in the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and OEMP (Emerge, 2025b) (Appendix Q) will ensure that the residual pollution incident risk is low.
		Minimise	• Construction management measures to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the risk for hydrocarbon spills to the marine environment is minimal so that there are no adverse impacts to the marine environment. Should a spill occur, response, containment and cleanup will be undertaken in accordance with the Spill Prevention and Response Plan (RIA, 2025) provided as Appendix V. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implement industry standard hydrocarbon management practices (chemical handling, storage, segregation, and spill response) – Any construction vessels including piling vessels/barges to establish a sewage and garbage disposal plan – Undertake vessel maintenance and bunkering in accordance with contractors approved vessel management systems – Hydrocarbon spills into the marine environment be immediately reported and appropriately remediated. Should a spill occur, response, containment and cleanup will be undertaken in accordance with the Spill Prevention and Response Plan (RIA, 2025) provided as Appendix V. • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that: – No liquid waste to be discharged anywhere in Rottnest Island waters, including waste from marine sanitation devices – Implement standard waste minimisation and reduction strategies, including providing facilities for waste disposal – Fuel / oil spill contingency plans are included in the OEMP and Spill Prevention and Response Plan (RIA, 2025) and includes the provision of clean-up equipment and appropriate disposal of contaminated water and sediment	

Potential impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
			– Pollution incidents will be reported to the DoT's Marine Environmental Emergency Response (MEER) unit, with clean up managed and monitored in accordance with MEER's requirements and the Spill Prevention and Response Plan (RIA, 2025). – Pollution incidents will be monitored during operation in accordance with the OEMP, with contingency actions implemented should pollution triggers be breached on a reoccurring basis – The underground fuel storage facility will be constructed in accordance with AS1940 and as outlined in the OEMP have safety and leak detection equipment installed.	
		Rehabilitate	Fuel and oil spills to be cleaned up in accordance with the contingency actions outlined in the Spill Prevention and Response Plan (RIA, 2025), DEMMP, CEMP and OEMP.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	
Disturbance of sediments from vessel operations (including propeller wash) in shallow water results in a temporary increase in suspended sediments.	Indirect	Avoid	Dredging to a depth of RL -3 m will significantly avoid vessel operations disturbing sediments.	**No residual impacts expected** The project design (proposed of the barge turning basin) and implementation of the OEMP (Appendix Q) ensures that residual impacts to marine environmental quality from a temporary increase in sediments during operation are unlikely.
		Minimise	• Operational management measures to minimise impacts to the marine environment are detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that marine users comply with vessel operational restrictions required by DoT and RIA. Management measures implemented to minimise this impact includes: – Vessels to comply with RIA and DoT boating guidelines for operations in shallow coastal areas to reduce sediment disturbance from propellers. • The monitoring program outlined in the OEMP (Appendix Q) includes quarterly water quality sampling and annual sediment quality sampling. This monitoring will be undertaken for the first two years of operations, and following this the frequency will be reviewed as necessary.	
		Rehabilitate	Impacts to marine water quality from operational activities will be temporary only (during vessel use) and due to the proposed design are considered unlikely to be significant. No rehabilitation is considered applicable.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	
Temporary decease in light availability for benthic communities and habitats due to suspended sediments.	Indirect	Avoid	As dredging activities are a requirement for construction of the proposal, a decrease in light availability due to an increase in suspended sediments during construction cannot be avoided.	**A temporary decrease in light available to benthic communities and habitats due to an increase in suspended sediments is predicted within the ZoMI only** As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, significant residual impacts are not considered likely. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address a temporary increase in TSS / turbidity during construction. Implementation of these management plans ensures that impacts to marine environmental quality outside the zones of influence from a temporary increase in suspended sediments are unlikely.
		Minimise	• As discussed in Section 7, temporary impacts from suspended sediments on benthic communities are predicted in the ZoMI only. These impacts include temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack. Baird (2025b) predicts that impacts to these benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities • Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24 – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	
		Rehabilitate	Impacts to marine water quality from an increase in TSS within the ZoMI and ZoI will be temporary only.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	
Temporary release of contaminants from marine sediment during dredging and reclamation activities.	Indirect	Avoid	• As dredging activities are a requirement for construction of the proposal, an increase in suspended sediments during construction cannot be avoided • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3.	**No residual impacts expected** As all baseline sediment results were below the assessment criteria, residual impacts from the temporary release of contaminants from suspended sediments is considered unlikely.
		Minimise	• The risk of temporary release of contaminants from marine sediments during dredging and reclamation activities will be minimal as all baseline sediment results did not record contaminants above the assessment criteria • Management and mitigation proposed during construction to minimise impacts to marine environmental quality is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI shown in Figure 24 • The CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. • The monitoring program outlined in the OEMP (Appendix Q) includes quarterly water quality sampling and annual sediment quality sampling. This monitoring will be undertaken for the first two years of operations, and following this the frequency will be reviewed as necessary.	
		Rehabilitate	Impacts to marine water quality from a potential release of contaminants from suspended sediments will be temporary only.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	
Disturbance of sediments from maintenance dredging during operation.	Direct	Avoid	The requirement for maintenance dredging will only be undertaken when required.	**No residual impacts expected** Maintenance dredging will be undertaken in accordance with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016). This will ensure that the residual risk of increased TSS from the disturbance of sediments from maintenance dredging is low.
		Minimise	• Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	
		Rehabilitate	Impacts to marine water quality from an increase in TSS will be temporary only.	
		Offset	Marine environmental quality offsets are not considered applicable to the proposal.	

9.7 Assessment and significance of residual impact

The anticipated significance of the residual impacts from the proposal following the implementation of mitigation measures are low and the residual impacts are summarised below:

- Temporary suspended sediments within the ZoHI (1.37 ha), ZoMI (4.5 ha) and ZoI (13.44 ha)
- Temporary reduction in light due to suspended sediments in the water column within the ZoMI (4.5 ha) may impact benthic communities and habitats. As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, these residual impacts are not considered significant.

The predicted residual impacts to marine environmental quality from the proposal is considered manageable through implementation of the CEMP, DEMMP and OEMP. With implementation of the mitigation measures proposed in these management plans, the residual impacts are not considered significant as discussed in Table 46.

Table 46: Consideration of the significance of the residual impacts on marine environmental quality

Matters for consideration	Response
The object and principles of the EP Act	The principles of the EP Act have been addressed in relation to the proposal (Table 26). Implementation of the CEMP, DEMMP and OEMP provides monitoring and management actions to identify and to address potential impacts during construction and operation.
Values, sensitivity and quality of the environment which is likely to be impacted	Baseline marine sediment and water quality investigations have been undertaken to determine the existing marine environmental quality values and sensitivity of the receiving marine environment. Given the low levels of contaminants of potential concern in the sediments, it is not expected that the suspension of contaminants within these sediments will have a significant impact on the marine environment. As discussed in Section 7, benthic communities and habitats may be sensitive to changes in marine environmental quality. This is discussed further in Section 7. With the proposed construction and operation mitigation management framework outlined in the CEMP, DEMMP and OEMP, the residual impact of the proposal is considered to be manageable.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	During the construction phase of the proposal, the following activities and resulting impacts have the potential to adversely affect marine environmental quality: • Construction, dredging and reclamation activities have the potential to: – Temporary increase in suspended solids, as discussed in Section 9.5.1.1. – Reduce light within the ZoHI and ZoMI. This impact is discussed further in Section 7, benthic communities and habitats. – Result in unplanned release of chemicals and / or hydrocarbons from fuel leaks from vessels, accidental vessel collision and ship grounds as discussed in Section 9.5.1.2. During operation of the proposal, potential impacts to marine environmental quality are limited to the following activities: • Unplanned release of chemicals and / or hydrocarbons from onshore fuel storage, fuel leaks from vessels, accidental vessel collision and ship grounds as discussed in Section 9.5.1.2. • Vessel operations (including propeller wash) in shallow water may disturb sediments, resulting in a temporary decrease in light availability for benthic communities and habitats. This impact is discussed further in Section 7 Benthic communities and habitats.

Matters for consideration	Response
	These impacts to marine environmental quality from the proposal are considered to be manageable through implementation of the CEMP, DEMMP and OEMP. With implementation of these management plans, the residual impacts are limited to: • Temporary suspended sediments within the ZoMI (4.5 ha) and ZoI (13.44 ha) • Temporary reduction in light due to suspended sediments in the water column within the ZoMI (4.5 ha). As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, these residual impacts are not considered significant.
Resilience of the environment	Existing boating facilities within Thomson Bay includes the existing jetty and moorings. Baseline marine sediment and water investigations indicate that these activities do not have a significant impact on the marine environment within Thomson Bay. Therefore, it is considered that the marine environment will be resilient to potential changes from implementation of the proposal.
Consequence of the application of the mitigation hierarchy to the proposal.	The WA Offsets Guidelines (Government of Western Australia 2014) identifies four levels of significance for residual impacts: • Unacceptable impacts – those impacts that are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset. • Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level. • Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement • Impacts which are not significant – impacts that do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset. Following the application of the mitigation hierarchy (Table 45) and taking into consideration the above significance of residual impacts model, RPS considers that there are no significant residual impacts to marine environmental quality from the proposal.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment has been completed with a high level of confidence in the predictions of residual impacts on marine environmental quality with the required scientific assessments conducted (e.g. baseline marine sediment and water investigations) in accordance with relevant guidelines (Table 41).
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

9.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to marine environmental quality are:

- **Dredging and construction activities**
  - Within two weeks following cessation of marine construction and dredging works, marine water quality will return to a High Level of Ecological Protection.

  - No reported hydrocarbon spills or release of waste into the marine environment from construction/dredging activities.

- **Operational activities**
  - No reported hydrocarbon spills or release of waste into the marine environment from operational activities.
  - No reduction in marine environmental quality (water, sediment and biota) from a High Level of Ecological Protection within and adjacent to the development envelope as a result of the proposal.
  - If maintenance dredging is undertaken, marine environmental quality (i.e. water and sediment quality) will remain consistent with triggers outlined in the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken).

As the impact assessment identified low residual risks to marine environmental quality following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet the EPA's objective to maintain the quality of water, sediment and biota so that environmental values are protected.

10 MARINE FAUNA

10.1 EPA objective

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

10.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process.

Table 47 lists relevant EPA guidance, other state and Commonwealth legislation / policy, and provides consideration for how these documents informed the proposal.

Table 47: Relevant legislation, policy and guidance

Legislation, policy and guidance	Consideration
Environment Protection and Biodiversity Conservation Act 1999	A search of DCCEEW's PMST was undertaken within a 5 km radius of the proposal to determine the MNES that are either known or likely to occur proximate to the proposal (Appendix R). Information contained in Commonwealth conservation advice, recovery plans and species profile and threats database records have been referenced to inform the assessment of impacts to marine species. A discussion of potential impacts on MNES is discussed in Section 14.2.
Biodiversity Conservation Act 2016	A search of the DBCA's NatureMap database was undertaken to determine a list of conservation significant fauna and flora species that have been recorded within 10 km of the proposal (Appendix R).
Environmental Factor Guideline: Marine Fauna (EPA, 2016j)	The environmental factor guideline identifies the highly diversity of marine fauna and acknowledges the importance of protecting marine fauna for their ecological roles, iconic nature and importance society places on them. These considerations were underpinned as part of the marine fauna desktop analysis provided in Appendix B and summarised in Section 10 of this report. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address an increase in threats from human interaction during construction and operation of the proposal.
National Biofouling Management Guidelines for Non-trading Vessels (Commonwealth of Australia, 2009a)	Implementation of the CEMP (Emerge, 2025a) (Appendix P) and OEMP (Emerge, 2025b) (Appendix Q) provides the management framework to mitigate risks posed by accidental marine species introduction during construction and operation activities. The IMS mitigation measures outlined in the management plans are consistent with the guidelines.
National Biofouling Management Guidelines for Commercial Vessels (Commonwealth of Australia, 2009b)	Implementation of the CEMP (Emerge, 2025a) (Appendix P) and OEMP (Emerge, 2025b) (Appendix Q) provides the management framework to mitigate risks posed by accidental marine species introduction during construction and operation activities. The IMS mitigation measures outlined in the management plans are consistent with the guidelines.

10.3 Environmental investigations

10.3.1 Marine fauna

A desktop marine fauna assessment was undertaken as part of the South Thomson Barge Landing Development Marine Fauna and Benthic Habitat Assessment (RPS, 2024a) and included assessment of conservation (national and WA state listed species) and non-conservation important marine species, that may be present in the Thomson Bay area. Fauna protected under the EPBC Act and BC Act was identified via desktop searches, as described below:

- A desktop search of the DBCA Threatened, Specially Protected and priority fauna database (DBCA database) was undertaken on request of RPS by the DBCA on 3 November 2023

- A search of DCCEEW's PMST
- The online literature search utilised the following resources to identify fish species recorded in the waters in and around Thomson Bay:
  - Hoschke, A. Whisson, G. & Moore, G. I. 2019. Complete list of fishes from Rottnest Island 2019. Compiled from a range of sources (including previous literature, ALA records and Reef Life Survey data)
  - iNaturalist citizen science observation platform: Fishes of Rottnest Island (iNaturalist, 2023), which compiles up-to-date citizen science observations of marine fishes around Wadjemup / Rottnest Island
  - Reef Life Survey (RLS) citizen science program data (AODN, 2023). Utilises trained scuba-divers to undertake standardised visual surveys in areas around Australia, including Wadjemup / Rottnest Island.

10.3.2 Marine fauna habitat

A benthic communities and habitat assessment was undertaken to support the proposal. Site investigations and results are discussed further in Section 7.3.

10.3.3 Underwater noise assessment

An underwater acoustic assessment was undertaken by Tetra Tech (2024) (Appendix S) for two piling methodologies at the piling locations shown in Figure 30.

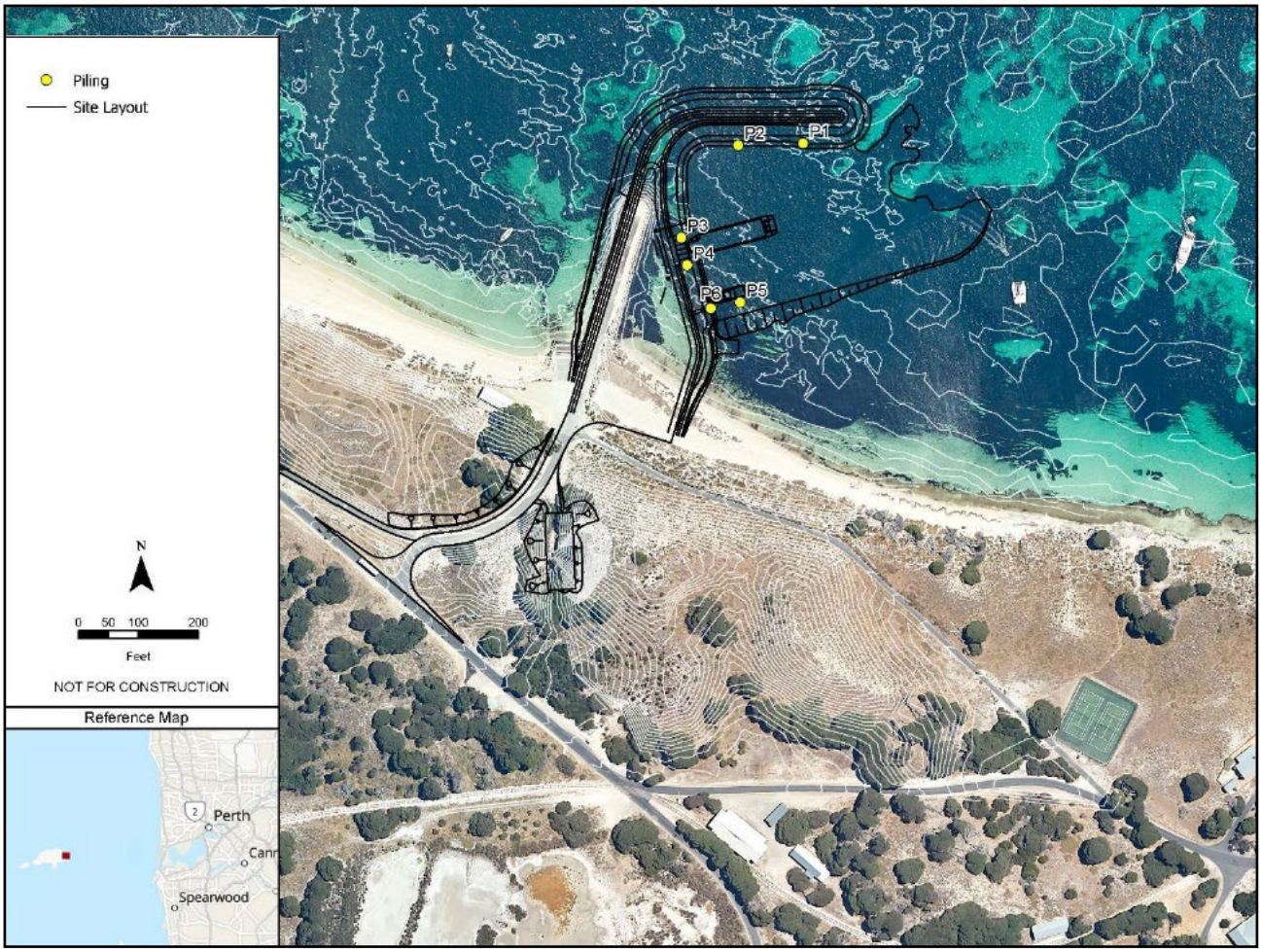


Figure 30: Underwater noise modelling – piling locations

10.4 Receiving environment

10.4.1 Benthic communities and habitats

Benthic habitat within South Thomson Bay is varied and includes seagrass meadows that include *P. sinuosa* and *P. australis.* Other benthic habitat within Thomson Bay includes macroalgae and bare sand, the latter which may be covered by wrack that accumulates seasonally (RPS, 2024a).

Benthic habitats are discussed further in Section 7 of this report.

10.4.2 Biologically important areas

The development envelope is within the Biologically Important Areas (BIA) for the species listed below. BIAs are regions where aggregations of individuals of a particular species are known or likely to display behaviours such as breeding, foraging, nesting or migration. BIAs were created to inform decision making under the EPBC Act.

- Bridled tern (the development envelope is within the foraging BIA for this species)
- Caspian tern (the development envelope is within the foraging BIA for this species)
- Fairy tern (the development envelope is within the foraging BIA for this species)
- Flesh footed shearwater (the development envelope is within the aggregation BIA for this species)
- Little penguin (the development envelope is within the foraging BIA for this species)
- Little shearwater (the development envelope is within the foraging BIA for this species)
- Pacific gull (the development envelope is within the foraging BIA for this species)
- Roseate tern (the development envelope is within the foraging BIA for this species)
- Wedge-tailed shearwater (the development envelope is within the foraging BIA for this species)
- Australian sea lion (the development envelope is within the foraging BIA for this species)
- Pygmy blue whale (the development envelope is within the distribution BIA for this species)
- Southern right whale (the development envelope is within the migration BIA for this species).

The potential for these species to occur within or adjacent to the development envelope is discussed further in the following sections.

10.4.3 Conservation significant marine fauna species

Based on the database searches and literature review undertaken to support the proposal (Appendix B), the species listed in (Table 48) may occur within South Thomson Bay (RPS, 2024a). Those species considered most likely to occur proximate to the development envelope are discussed in the following sections.

Marine and migratory species listed under the EPBC Act are discussed in Section 14.2.

Table 48: Conservation significant marine fauna species (RPS, 2024a)

Name		Conservation status		Distribution at Wadjemup / Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	**Common**	**EPBC Act**	**BC Act**		
Fish					
Acentronura australe	Southern pygmy pipehorse	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit algal reefs and seagrass beds, to depths of up to 30 m (Fishes of Australia (FoA), 2024).
Campichthys galei	Gale's pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit shelly or rubble substrates and sparse seagrass beds, to depths of up to 18 m (FoA, 2024).
Choeroichthys suillus	Pig-snouted pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit rubble habitats of inshore coral reefs, to depths of up to 15 m (FoA, 2024).
Halicampus brocki	Brock's pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit coral and algal reefs, to depths of up to 45 m (FoA, 2024).
Heraldia nocturna	Upside-down pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit sheltered inshore rocky reefs, to depths of up to 30 m (FoA, 2024).
Hippocampus angustus	Western spiny seahorse	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit sheltered algal reefs and seagrass beds, to depths of up to 30 m (FoA, 2024).
Hippocampus breviceps	Short-head seahorse	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit shallow seagrass and macroalgal beds, to depths of up to 15 m (FoA, 2024).
Hippocampus subelongatus	West Australian seahorse	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit macroalgal beds, muddy substrates, jetty pylons and moorings to depths of up to 25 m (FoA, 2024).
Histiogamphelus cristatus	Rhino pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds and adjacent sandy areas, to depths of up to 17 m (FoA, 2024).
Lissocampus caudalis	Australian smooth pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit rubble habitats, macroalgal beds and seagrass beds and rocky reefs, to depths of up to 15 m (FoA, 2024).
Lissocampus fatiloquus	Prophet's pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit rocky and sand habitats, and seagrass and macroalgal beds, to depths of up to 10 m (FoA, 2024).
Lissocampus runa	Javelin pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass and macroalgal beds and rubble substrates, to depths of up to 20 m (FoA, 2024).
Maroubra perserrata	Sawtooth pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit coral reefs, to depths of up to 25 m (FoA, 2024).
Mitotichthys meraculus	Western crested pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds to depths of up to 10 m (FoA, 2024).
Nannocampus subosseus	Bony-headed pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit a range of habitats including seagrass and macroalgal beds, sandy and coral reef habitats, to depths of up to 14 m (FoA, 2024).
Phycodurus eques	Leafy seadragon	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds and algal reefs, to depths of up to 50 m (FoA, 2024).
Phyllopteryx taeniolatus	Common seadragon	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds and algal reefs, to depths of up to 50 m (FoA, 2024).
Pugnaso curtirostris	Pugnose pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit shallow seagrass and macroalgal beds, to depths of up to 11 m (FoA, 2024).
Solegnathus lettiensis	Gunther's pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Little is known about the habitat for this species.
Stigmatopora argus	Spotted pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds, to depths of up to 8 m (FoA, 2024).
Stigmatopora nigra	Widebody pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit sheltered seagrass and macroalgal beds, to depths of up to 35 m (FoA, 2024).
Syngnathoides biaculeatus	Double-end pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass and macroalgal beds, to depths of up to 10 m (FoA, 2024).
Urocampus carinirostris	Hairy pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass beds, to depths of up to 6 m (FoA, 2024).
Vanacampus margaritifer	Mother-of-pearl pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass and macroalgal beds, rocky and sandy substrates, to depths of up to 15 m (FoA, 2024).
Vanacampus phillipi	Port Phillip pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit seagrass and macroalgal beds, to depths of up to 25 m (FoA, 2024).
Vanacampus poecilolaemus	Longsnout pipefish	Listed (Marine)	Not included	Species or species habitat may occur within area	Inhabit shallow seagrass and macroalgal beds, to depths of up to 18 m (FoA, 2024).
Sharks					
Sphyrna lewini	Scalloped hammerhead	Conservation Dependent	Not included	Species or species habitat likely to occur within area	Undertake annual foraging and breeding migrations. Known to aggregate in the Shoalwater Islands Marine Park, where peak numbers are observed during January and February (López, 2023).
Carcharias taurus (west coast population)	Grey nurse shark (west coast population)	Vulnerable	Vulnerable	Congregation or aggregation known to occur within area	Year-round presence. Seasonal migration patterns have not been observed (DCCEEW, 2023b).
Carcharodon carcharias	White shark	Vulnerable, Migratory	Vulnerable	Species or species habitat known to occur within area	Have been shown to undertake migrations north along the WA coast during spring and return in summer; however, coastal movements are not synchronous. They are frequently recorded in waters around fur seal and sea lion colonies, including in the Perth region (DCCEEW, 2023b), where they are more likely to be present during spring and early summer and least likely to be present during late summer and autumn (SharkSmart, 2018).

Name		Conservation status		Distribution at Wadjemup / Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	Common	EPBC Act	BC Act		
Mammals					
Neophoca cinerea	Australian sea lion	Endangered	Endangered	Species or species habitat likely to occur within area. The development footprint is located within the foraging BIA for this species.	Has an asynchronous non-annual breeding cycle with cycles ranging from 16 to 20 months and pupping occurring at different times throughout the South-West Marine Region (DCCEEW, 2023b).
Eubalaena australis	Southern right whale	Endangered, Migratory	Vulnerable	The development footprint is located within the migratory BIA for this species†	Southern temperate to subpolar waters including marine areas of southern Australia from May to October. The migratory period within the migration BIA up the west coast of WA is April to October (National Conservation Values Atlas, 2023).
Balaenoptera musculus brevicauda	Pygmy blue whale	Endangered	Endangered (as *Balaenoptera musculus)*	Known to occur in the area. The development footprint is located within the distribution BIA for this species.	The northbound migration past Perth Canyon occurs between April and July (peak May to June), with the return migration from October to January (peak November to early December.
Megaptera novaeangliae	Humpback whale	Migratory	Conservation Dependent, Migratory	Species or species habitat known to occur within area. The development footprint is located within the migratory BIA for this species.	The annual peak northbound migration along the Jurien Bay to Carnarvon migration route occurs between June and July, while the southbound migration peak occurs between September and October (DCCEEW, 2023b).
Orcinus orca	Killer whale, orca	Migratory	Migratory	Species or species habitat may occur within area	Mating is known to occur all year round, whilst the calving season spans several months. However, no areas of significance and no determined migration routes have been identified for this species within waters off WA (DCCEEW, 2023b). They are typically present on the south coast of WA between January to April.
Arctocephalus forsteri	New Zealand fur seal	Listed (Marine)	Other Specially Protected	Species or species habitat may occur within area. The New Zealand fur seal colony on Wadjemup / Rottnest Island is located at Cathedral Rocks on the west end of Wadjemup / Rottnest Island.	Present year round (ALA, 2023)
Balaenoptera acutorostrata	Minke whale	Listed (Cetacean)	Migratory	Species or species habitat may occur within area	May migrate from high latitude areas in the summer to low latitude areas in the winter. The detailed pattern of seasonal migration is generally poorly understood (ALA, 2023).
Tursiops aduncus	Indian Ocean bottlenose dolphin	Listed (Cetacean)	Not included	Species or species habitat likely to occur within area	Present year-round. Movement patterns in Australia are variable.
Tursiops truncatus s. str.	Bottlenose dolphin	Listed (Cetacean)	Not included	Species or species habitat may occur within area	Seasonal movements are variable, and may include residency in small areas, long-range movements, and migration (DCCEEW, 2023b).
Stenella longirostris	Spinner dolphin	Listed (Cetacean)	Priority 4, Migratory	Sighted in field survey in DBCA database data. Assumed species or species habitat may occur within area.	No seasonal differences, but mostly offshore species (ALA, 2023)
Reptiles					
Caretta caretta	Loggerhead turtle	Endangered, Migratory	Endangered	Foraging, feeding or related behaviour known to occur within area	Generally nesting in summer at nesting grounds in northern WA (not necessarily every year; ALA, 2023).
Dermochelys coriacea	Leatherback turtle	Endangered, Migratory	Vulnerable	Species or species habitat known to occur within area	Migrates from foraging areas to nesting beaches in tropical and subtropical regions during summer (ALA, 2023; DCCEEW, 2023b).
Chelonia mydas	Green turtle	Vulnerable, Migratory	Vulnerable	Foraging, feeding or related behaviour known to occur within area	Migrates from foraging areas to nesting beaches in tropical regions during summer, typically between November and March (DCCEEW, 2023b).
Pelamis platurus	Yellow-bellied sea snake	Listed (Marine)	Not included	Species or species habitat may occur within area	Seasonal movements have not been observed in Australia hence may be present year-round.
Birds					
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	Critically Endangered	Species or species habitat known to occur within area	The northern Siberian bar-tailed godwit occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (TSCC, 2016).
Calidris tenuirostris	Great knot	Critically Endangered	Critically Endangered	Roosting known to occur within area	The great knot has been recorded around the entirety of the Australian coast and is common on the coasts of the Pilbara and Kimberley, from the Dampier Archipelago to the Northern Territory border. Great knots prefer sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons (DCCEEW, 2023).
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Critically Endangered	Species or species habitat known to occur within area	In Western Australia, the curlew sandpiper is widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division. They mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons.
Numenius madagascariensis	Eastern curlew	Critically Endangered	Critically Endangered	Species or species habitat likely to occur within area	The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Cornel University 2023).
Charadrius mongolus	Lesser sand plover	Endangered	Endangered	Roosting known to occur within area	The lesser plover mainly occurs in northern and eastern Australia, rare in south-western Australia. The species is almost strictly coastal, preferring sandy beaches, mudflats of coastal bays and estuaries, sand flats and dunes near the coast (Cornell University, 2023).

Name		Conservation status		Distribution at Wadjemup / Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	Common	EPBC Act	BC Act		
Calidris canutus	Red knot	Endangered	Endangered	Species or species habitat known to occur within area	The red knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms (Higgins, 1996)
Rostratula australis	Australian painted snipe	Endangered	Endangered	Species or species habitat may occur within area	The Australian painted snipe lives in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh (TSSC, 2013)
Charadrius leschenaultii	Greater sand plover	Vulnerable	Vulnerable	Species or species habitat known to occur within area	Mainly occurs on sheltered sandy, shelly or muddy beaches, large intertidal mudflats, sandbanks, salt marshes, estuaries, coral reefs, rocky islands rock platforms, tidal lagoons and dunes near the coast (Cornel University 2023).
Sternula nereis nereis	Australian fairy tern	Vulnerable	Vulnerable	Foraging, feeding or related behaviour known to occur within area. Migrant breeding, breeding habitat present within the area.	In south-western Australia, the fairy tern breeds between October and March with peak breeding between December and January. The natural jetty at the end of Philip Point is an important roost site for fairy terns.
Eudyptula minor	Little penguin	Marine		Breeding known to occur within area.	In the Perth region, it breeds in seawalls, in limestone rock cavities and underneath vegetation. The closest known breeding colonies are Garden Island and Penguin Island. No known breeding occurs on Wadjemup / Rottnest Island; however South Thomson Bay is within the foraging BIA for this species
Onychoprion anaethetus	Bridled tern	Marine Migratory		Breeding known to occur within area.	The bridled tern is a common visitor to Rottnest to breed (Rottnest Island Authority, 2019). It forms small colonies and nests on the ground usually in areas sheltered by plants, ledges or caves. There are no known breeding colonies within the vicinity of the proposal and due to the high level of disturbances from recreational users at Thomson Bay, there are unlikely to be any significant roosting sites within vicinity of the proposal. Consequently, impacts as a result of the proposal are unlikely.
Hydroprogne caspia	Caspian tern	Marine Migratory		Breeding known to occur within area.	The proposal is located within the foraging BIA for the Caspian tern and a small number of Caspian terns roost at Natural Jetty. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely.
Thalasseus bergii	Crested tern	Marine Migratory		Breeding known to occur within area.	The crested tern is the most common tern on the island, with the main nesting colonies located on Lake Baghdad and Herschel Lake (Rottnest Island Authority, 2019b). The crested tern may roost at the Natural Jetty. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely.
Sterna dougallii	Roseate tern	Marine Migratory		Breeding known to occur within area.	The proposal is located within the foraging BIA for the roseate tern. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely. However, as roseate terns roost at Natural Jetty, potential indirect impacts to this species have been considered.
Ardenna pacifica	Wedge-tailed shearwater	Marine Migratory		Breeding known to occur within area.	The wedge tailed shearwater is known to breed in burrows on Wadjemup / Rottnest Island between August to May (DCCEEW, 2023). Significant breeding habitat for this species is located on the west end of the island, such as on Cape Vlamingh, and impacts to this species or its habitat are unlikely as a result of the proposal.
Pandion haliaetus	Osprey	Marine Migratory		Breeding known to occur within area	The osprey is known to breed on stacks at the west end of the island (Holsworth, 1965) and is not known to breed within or proximate to the development envelope.

*As listed in the PMST search results and/or Atlas of Living Australia (ala.org.au)

† Although the PMST search indicates that breeding by *E. australis* may occur within the PMST search area, a review of the online National Conservation Values Atlas indicates that this is not the case and only the migration BIA for the species overlaps Thomson Bay

Definitions: BC Act = *Biodiversity Conservation Act 2016* (WA), BIA = Biologically Important Area, DBCA = Department of Biodiversity, Conservation and Attractions (WA), EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Priority 4 = Rare, Near Threatened and other species in need of monitoring (BC Act)

Other Specially Protected = Species otherwise in need of special protection (BC Act)

10.4.3.1 Marine mammals

10.4.3.1.1 New Zealand fur seal

There is a colony of New Zealand fur seals located on the west end of Wadjemup / Rottnest Island, approximately 10 km from the development envelope. The boating prohibited area at Cathedra Rocks to protect this colony is shown in Figure 31, and the location in respect to the proposal is shown in Figure 32.

Although the development envelope is not located within vicinity of any important breeding habitat for this species, the New Zealand fur seal is likely to forage in the waters around the development envelope.

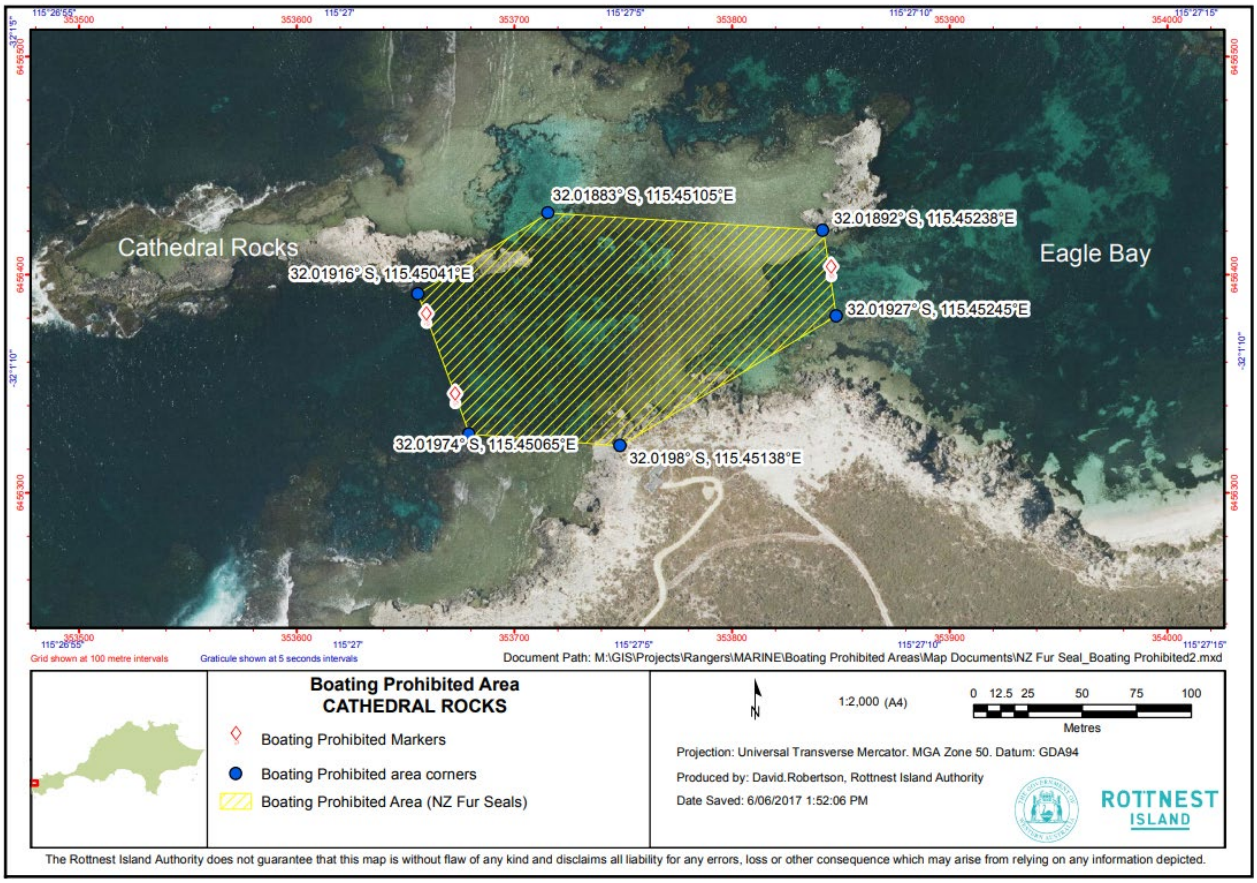


Figure 31 Cathedral Rocks Boating Prohibited Area

10.4.3.1.2 Australia sea lion

The South West Marine Region (SWMR) is an important foraging and breeding region for Australian sea lions, with 99% of the population occurring within the SWMR (McClatchie, 2006). Breeding colonies are considered to be habitat critical to the survival of this species. The location of known breeding colonies is shown in Figure 33. There are no known breeding colonies on Rottnest Island, however, the Australia sea lion foraging BIA extends along the west coast of Australia, south of Geraldton down to Perth. The development envelope overlaps the foraging BIA for this species and there is a haul out site at Dyer Island, within Porpoise Bay on the southern side of Wadjemup / Rottnest Island. The location of Dyer Island in respect to the proposal is shown in Figure 32. As such, although there is no critical habitat for this species within or adjacent to the development envelope, this species is likely to occasionally occur within or within vicinity of the development envelope.

Figure 32 Location of Australian Sea Lion haul out areas and New Zealand Fur Seal colonies

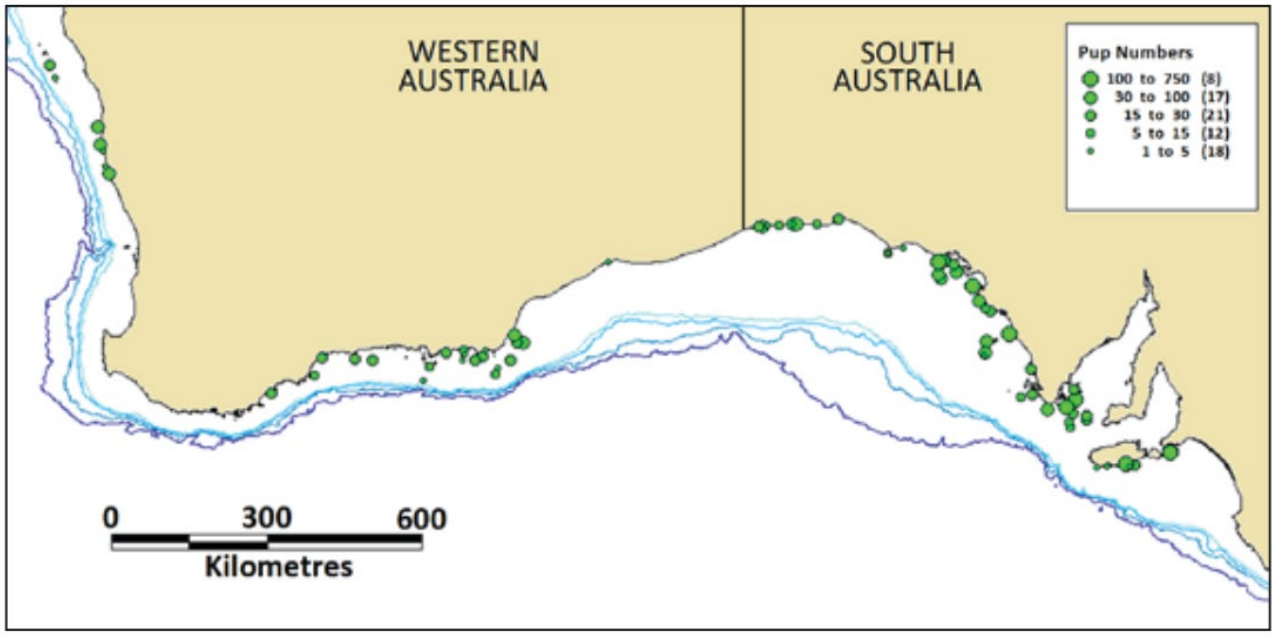


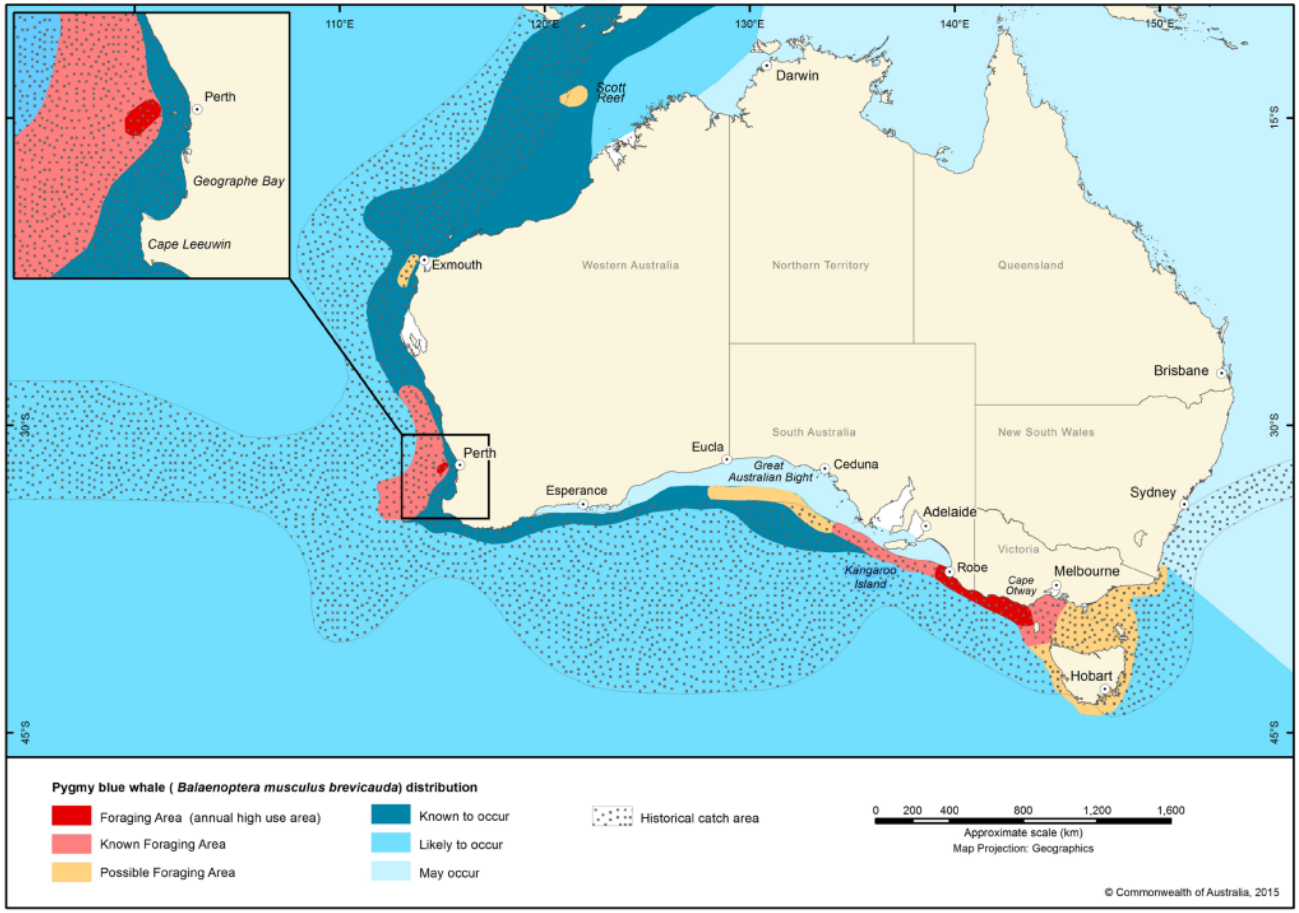
Figure 33 Australian sea lion breeding colonies (DSEWPC, 2013)

10.4.3.1.3 Whales

Cetacean species, such as the pygmy blue whale (*Balaenoptera musculus brevicauda*), southern right whale (*Eubalaena australis*) and humpback whale (*Megaptera novaeangliae*), are known to transit between Southern Ocean feeding grounds and tropical water breeding grounds. Consideration of the important of critical habitats for whale species which may occur proximate to South Thomson Bay (Table 48):

- Humpback whale (Migratory)
  - The humpback whale migration, breeding, and calving BIA extend along the length of the WA coast, to its northernmost extent offshore of the Kimberley. The migration BIA overlaps the development envelope and this species may occur proximate to the development envelope.

- Pygmy blue whale (Endangered, Migratory)
  - Wadjemup / Rottnest Island is located within the known distribution of this species, but outside of the known foraging areas (Figure 34). Pygmy blue whale migration and known foraging area BIAs pass along the shelf edge at depths between 500 m and 1,000 m. Although the development envelope does not occur within the known foraging BIA or migration BIA for this species, the west end of Wadjemup / Rottnest Island is located within a BIA and it is therefore likely that this species occurs proximate to the development envelope during migration. The northern migration of the pygmy blue whale (from Augusta to Derby) occurs between April and July (peak periods in May and June), with a return southbound migration from October to January (peak periods in November and December) (McCauley R.D. and Jenner, 2010).
- Southern right whale (Endangered, Migratory).
  - The southern right whale migration BIA, which extends all the way up the west coast of WA as far north as Ningaloo Reef, overlaps the development envelope (Figure 35). The nearest reproductive BIA is over 1,000 km away.



Foraging Area (Annual high use area)	Blue whales are regularly observed feeding on a seasonal basis
Known Foraging Area	Known foraging occurs in these areas but is highly variable both between and within seasons
Possible Foraging Area	Evidence for feeding is based on limited direct observations or through indirect evidence, such as occurrence of krill in close proximity of whales, or satellite tagged whales showing circling tracks. Blue whales travel through on a seasonal basis, possibly as part of their migratory route

Known to occur	Blue whales are known to occur based on direct observations, satellite tagged whales or based on acoustic detections
Likely to occur	Blue whales are likely to occur based on occasional observations in the area and nearby areas
May occur	Evidence for the presence of blue whales through strandings or rare observations
Historical catch area	Blue whales were caught during the whaling period based on whaling data

Figure 34: Pygmy blue whale distribution (DoE, 2015)

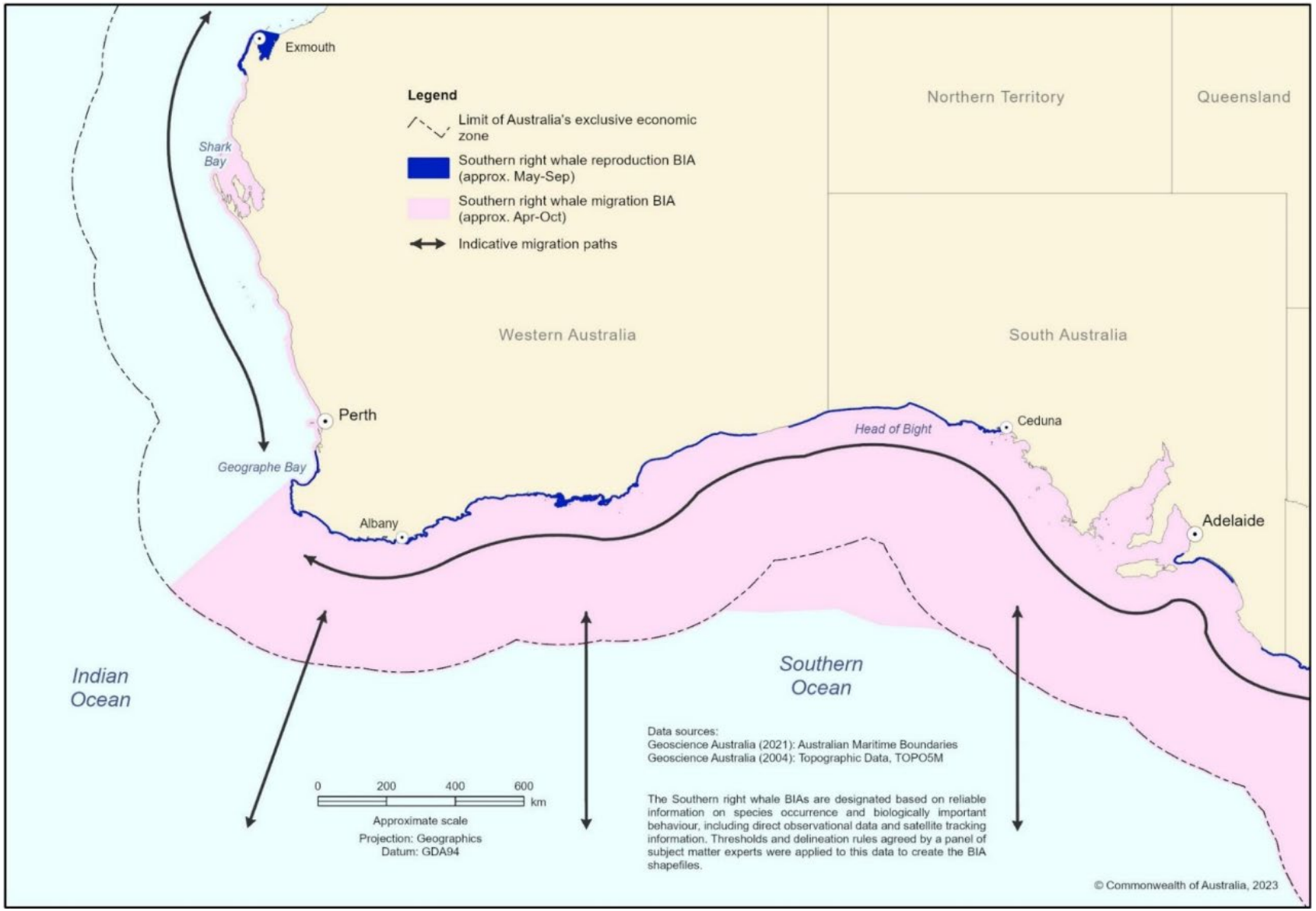


Figure 35: Southern right whale Biologically Important Areas and habitat critical to the survival (reproduction BIA) in Western Australia (DCCEEW, 2024)

10.4.3.2 Shark species

The development envelope does not overlap with any known BIAs for shark or ray species. However, the following conservation significant shark species are considered likely to occasionally occur proximate to the development envelope:

- White shark
  - White sharks can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. Areas where white shark observations are more frequent include waters in and around some fur seal and sea lion colonies (DSEWPC, 2012). It is likely that this species may occasionally occur proximate to the development envelope due to the presence of the New Zealand fur seal colony at the west end of the island.
- Scalloped hammerhead
  - Scalloped hammerheads migrate yearly for foraging and breeding purposes and the closest aggregation area for the species to the development envelope is the Shoalwater Islands Marine Park, when peak numbers are observed during January and February (López, 2023).
- Grey nurse shark.
  - In Australia, the grey nurse shark has an inshore coastal distribution primarily in sub-tropical to cool temperate waters on the continental shelf. Grey nurse sharks are often observed aggregating around inshore rocky reefs or islands. At these locations they are typically found near the seabed (at depths of 10–40 m) in deep sandy or gravel filled gutters, or in rocky caves. These sites are considered habitat critical to the survival of the species. There are no confirmed aggregation sites in W.A. waters, however it is considered possible that this species may occasionally occur proximate to the development envelope (DoEE, 2014).

10.4.3.3 Marine bird species

Conservation significant marine bird species that may occur proximate to the development envelope are discussed below. There is potential for other marine bird species to opportunistically occur proximate to the site, these species are listed in Table 48:

- Little penguin (Marine)
  - The development envelope overlaps with a foraging BIA for this species. The little penguin is endemic to Australia and New Zealand and found along the southern coast of Australia from Carnac Island (WA) to Broughton Island (NSW), including Shoalwater Islands Marine Park, Penguin Island, and the Geographe Bay area (DoEE 2019). This species is known to breed at Garden Island and Penguin Island, over 20 km south of the development envelope, and may forage proximate to the development envelope. There is no known breeding habitat proximate to the development envelope, and although these species may occasionally occur within South Thomson Bay, the development envelope is not considered likely to provide critical habitat for this species.
- Shearwaters. wedge-tailed shearwaters (*Ardenna pacifica*), little shearwaters (*Puffinus assimilis tunneyi*), flesh-footed shearwaters (*Ardenna caneipes*) and short-tailed shearwaters (*Ardenna tenuirostris*) are regularly found within the South-west Marine Region and breed in the south-west of WA.
  - Wedge-tailed shearwater
    - The wedge-tailed shearwater is known to breed on the west end of Wadjemup / Rottnest Island (DSEWPC, 2012). Although there are no known breeding colonies proximate to the development envelope, this species may forage in the water proximate to the development envelope.
  - Little shearwater
    - The development envelope overlaps with a foraging BIA for this species. The little shearwater is found along the entire southern coast of Australia, including the Houtman Abrolhos Islands, the Recherche Archipelago, and the islands of the Dampier Archipelago in WA (DAWE 2020b). The species inhabits offshore waters and breed on small islands, in burrows or rocky

crevices. Little shearwaters spend most of their lives at sea but return to breeding colonies on islands to mate and raise their young. They are known for their long-distance migrations, with some individuals traveling from their breeding grounds in south-western WA to the north Pacific and Arctic oceans (Commonwealth of Australia, 2020). The fauna assessment undertaken by RPS (2024a) and EcoLogical (2024) did not identify any important habitat for this species within the development envelope, although it may occassioanlly forage within or proximate to South Thomson Bay.

  - Flesh footed shearwater
    - The development envelope overlaps with an aggregation BIA for this species. In Australia, the flesh-footed shearwater is commonly found along the southern continental shelf (south-west WA to south-east QLD). The species breed on islands off the coast of south-west WA and are nocturnally active at breeding grounds (Department of the Environment and Energy, 2024). The fauna assessment undertaken by RPS (2024a) and EcoLogical (2024) did not identify any important habitat for this species within the development envelope, although it may occassioanlly forage within or proximate to South Thomson Bay.
  - Short tailed shearwater
    - This species breeds on Tasmanian offshore islands and off the coast of southern Australia, with the bulk of the population in the south-east. Breeding occurs mainly on coastal islands, typically in areas of grassland or other vegetation, but sometimes cliffs or bare ground (Commonwealth of Australia, 2020). The fauna assessment undertaken by RPS (2024a) and EcoLogical (2024) did not identify any important habitat for this species within the development envelope, although it may occassioanlly forage within or proximate to South Thomson Bay.

- Caspian tern (Marine, Migratory)
  - The development envelope overlaps with a foraging BIA for this species. In WA, the species is widespread along coastal regions, from the Great Australian Bight to the Dampier Peninsula. Breeding occurs along the entire south-west region (Higgins, 2003). The closest breeding populations are found on islands of the Turquoise Coast and Houtman Abrolhos. These birds are likely to be largely sedentary or make only short-range movements within the region. Caspian terns are a diurnal coastal foraging species that predominantly feed on whiting and mullets, and roost on land at night. This species may roost at the natural jetty, approximately 800 m to the east of the development envelope and may occasionally forage in the area. There is no critical habitat for this species present in the development envelope.
- Bridled tern (Marine, Migratory)
  - The development envelope overlaps with a foraging BIA for this species. This species is known to breed on Penguin Island, over 20 km south of the development envelope and may forage proximate to the development envelope. This species may also roost at the natural jetty, approximately 800 m to the east of the development envelope. There is no critical habitat for this species present in the development envelope.
- Crested tern (Marine, Migratory)
  - The species breeds in colonies or groups on offshore islands, low-lying coral reefs, sandy or rocky coastal islets and coastal spits (Commonwealth of Australia, 2020). The fauna assessment undertaken by RPS (2024a) and EcoLogical (2024) did not identify any important habitat for this species within the development envelope. However, this species may also roost at the natural jetty, approximately 800 m to the east of the development envelope. There is no critical habitat for this species present in the development envelope.

- Roseate tern (Marine, Migratory)
  - The development envelope overlaps with a foraging BIA for this species. The roseate tern occurs in both coastal and marine subtropical/tropical areas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands (Department of Agriculture, Water and Environment, 2021). Roseate terns are a diurnal coastal foraging species that feed on small schooling bait fish, often brought to the surface by predatory fish, such as tuna. This species roosts on land at night. In WA, roseate terns are regularly recorded north from Mandurah to Eighty Mile Beach, in the Pilbara Region (DAWE 2021a). This species may roost at the natural jetty, approximately 800 m to the east of the development envelope and may occasionally forage in the area. There is no critical habitat for this species present in the development envelope.
- Fairy tern (Vulnerable)
  - The development envelope overlaps with a foraging BIA for this species. Within Australia, fairy terns occur along the coasts of VIC, TAS, SA, and WA. In WA, there are two populations of fairy terns. The first is a semi-migratory population that breeds between Israelite Bay on the south-eastern coast and Northwest Cape, and overwinter at the Houtman Abrolhos. The second, probably sedentary population occurs on Pilbara islands, as far north as the Dampier Archipelago near Karratha (Dunlop, 2022). This species may roost at the natural jetty, approximately 800 m to the east of the development envelope and may occasionally forage in the area. There is no critical habitat for this species present in the development envelope.

10.4.3.4 Turtles

Turtle species which may occur within or proximate to South Thomson Bay are discussed in Table 48 and include the green turtle, leatherback turtle and loggerhead turtle. As shown in Figure 36 to Figure 38, South Thomson Bay is within the known range of these species, however there are no nesting or internesting areas proximate to the site.

Turtles migrate to and from their nesting grounds in northern WA during summer (typically between November and March) and their common distribution is north of the development envelope. However, they are known to forage on and in seagrass meadows and may occasionally occur in the area.

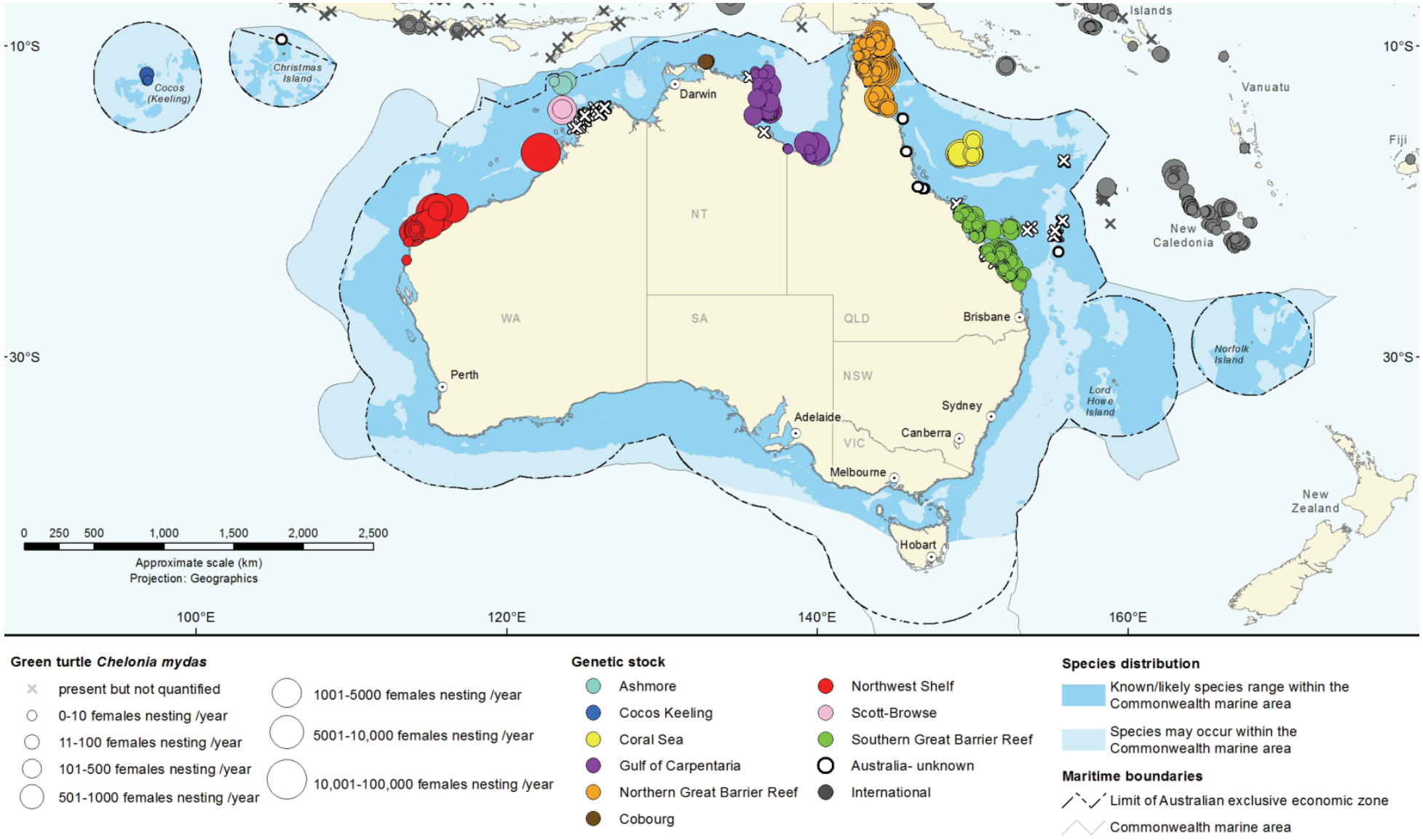


Figure 36: Green turtle habitat in Australia (DoEE, 2017)

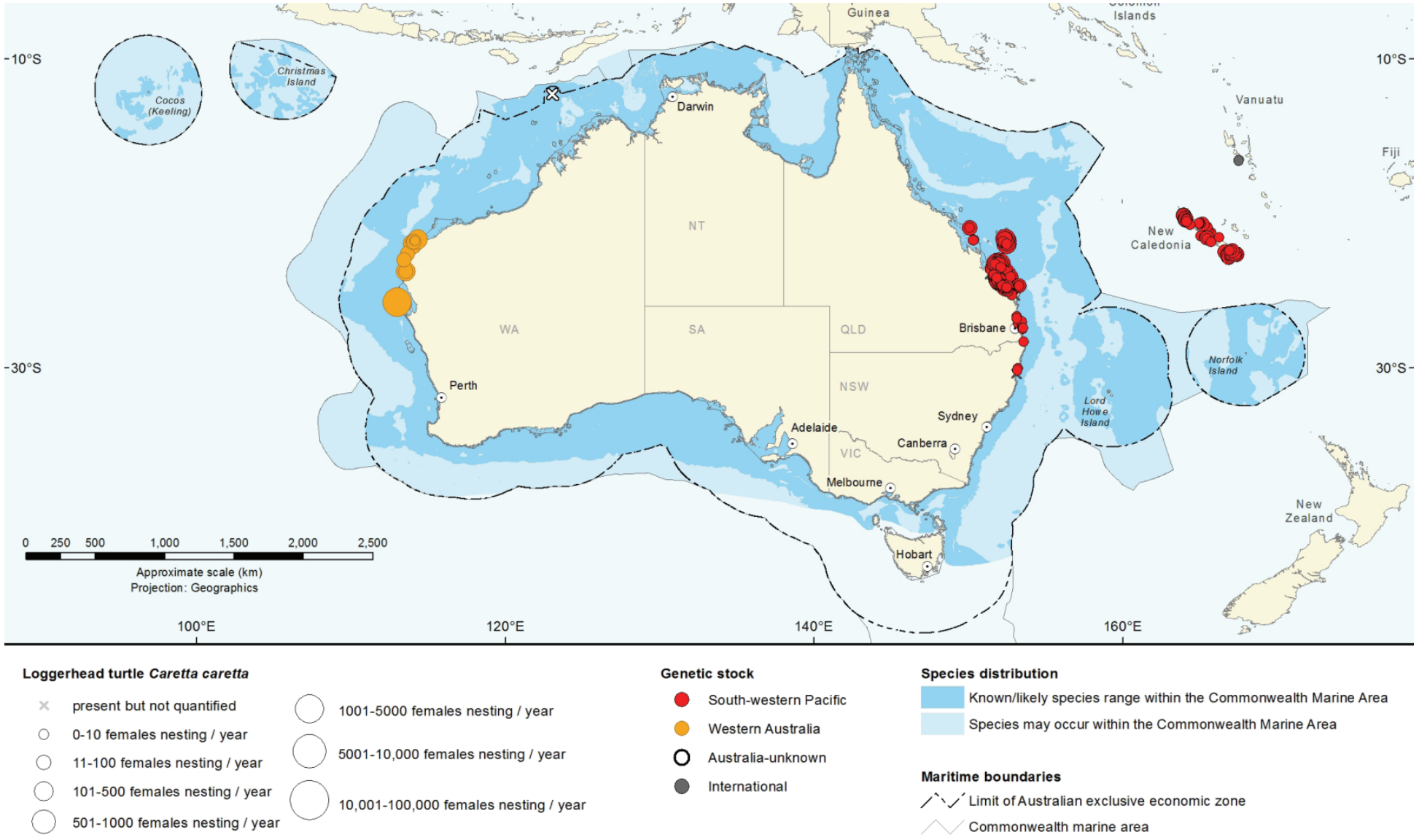


Figure 37: Loggerhead turtle habitat in Australia (DoEE, 2017)

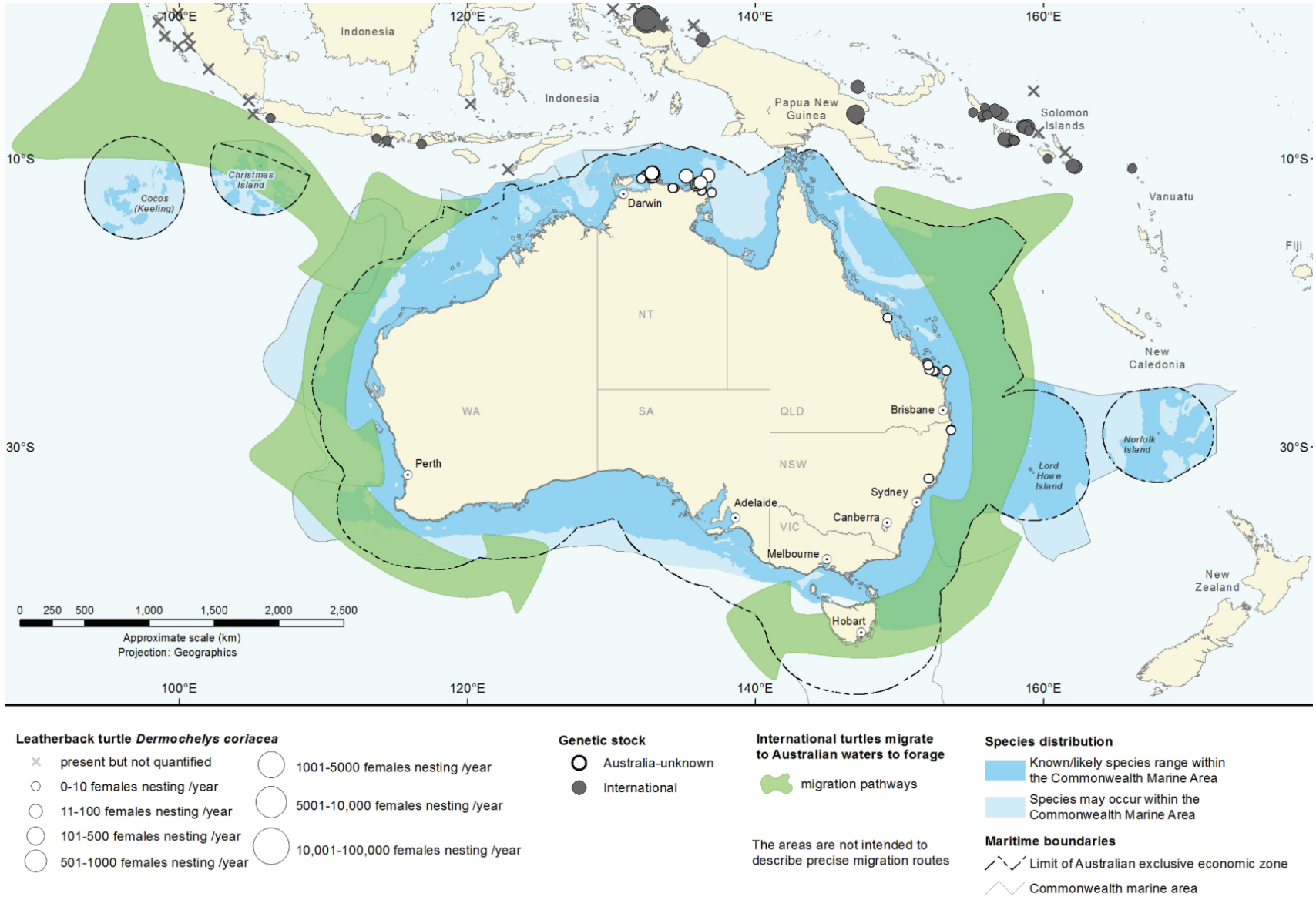


Figure 38: Leatherback turtle habitat in Australia (DoEE, 2017)

10.5 Potential environmental impacts

Table 49 provides the potential key impacts to marine fauna from the proposal. These impacts are discussed in further detail in Sections 10.5.1.1 to 10.5.1.7.

Table 49: Potential impacts on marine fauna

Phase	Impact class	Works / operations	Potential impacts
Construction	Direct	• Dredging • Breakwater construction • Reclamation (decant from reclamation area)	**Loss of benthic habitats** • Removal of 3.32 ha of potential marine fauna habitats as a result of the construction of the proposal (e.g. dredging). Indirect (and recoverable) impacts from dredging are discussed later in this table: – Permanent loss of 2.06 ha mixed seagrass – Permanent loss of 1.26 ha sand with wrack
		• Piling	**Elevated underwater noise from activities such as piling and dredging**
		• Dredging (including the use of silt curtains).	**Increased risk of entanglement or entrainment** • Risk of entrainment during dredging with the potential to cause injury, death, displacement, adverse behavioural and physiological changes.
		• Vessel operations	**Risk of vessel collision** • Increased collision risk leading to injury/mortality of marine fauna.
		• Breakwater construction	**Risk of injury or death from rock dumping during breakwater construction** • Increased risk of injury/mortality of marine fauna.
		• Artificial lighting from moored/inactive construction vessels (low impact lighting for navigational safety). • Artificial lighting from onshore construction areas (low impact lighting for security / safety)	**Potential impacts from artificial lighting** • Potential temporary and localised impacts from artificial lighting on areas surrounding the moored vessels and adjacent to the construction area, affecting movements and behaviours of marine fauna.
	Indirect	• Construction vessels movement and activities	**Increased risk of introduction of Introduced Marine Species (IMS)** • Increased risk of introduction of IMS could change the local ecology, impacting marine fauna species. **Increased risk of pollution incidents** • Increased risk of pollution incidents from vessels leading to degradation of marine environment has the potential to indirectly impact marine fauna.
		• Dredging • Breakwater construction • Reclamation (decant from reclamation area)	**Loss of benthic habitats** • The temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI from an increase in TSS. **Temporary increase in turbidity** • Reduction in marine environmental quality (e.g. increased suspended sediment / turbidity) may impact on marine fauna behaviours. • Dredging activities can impact benthic marine organisms, including infauna and epifauna through sedimentation and reduction in light availability as a result of increased suspension of sediments.
Operation	Direct	• Increase in vessel activity	**Risk of vessel collision** • Increase collision risk with vessels leading to injury/mortality of marine fauna.

Phase	Impact class	Works / operations	Potential impacts
		• Maintenance dredging (if required)	**Increased risk of entanglement or entrainment** • Risk of entrainment during dredging with the potential to cause injury, death, displacement, adverse behavioural and physiological changes.
	Indirect	• Increase in vessel activity	**Increased risk of introduction of IMS** • Increased risk of introduction of IMS could change the local ecology. **Increased risk of pollution incidents** • Increased risk of pollution incidents from vessels leading to degradation of marine environment.
		• Artificial and permanent lighting along the marine structure	**Potential impacts from artificial lighting** • Localised, permanent source of potential disruption to marine fauna that alter behaviours / movements.

10.5.1 Assessment of impacts

10.5.1.1 Summary of key marine fauna receptors

Some marine fauna species are likely to occur with Thomson Bay year-round, while others are migratory visitors. There are critical times of the year where marine fauna species are undergoing key stages of their life cycle and are therefore more susceptible to disturbance. Table 50 summarises the conservation significant fauna species that may occur proximate to the proposal, and the key ecological windows for these marine fauna species.

Table 50: Key marine fauna receptors and associated ecological windows

Sensitivity Peak period / Mammals / Fish / Birds / Reptiles	January	February	March	April	May	June	July	August	September	October	November	December
Humpback whale (north migration)[1]												
Humpback whale (south migration)[1]												
Pygmy blue whale (north migration)[2]												
Pygmy blue whale (south migration)[2]												
Southern right whale migration[2]												
Australian sea lion												
New Zealand fur seal												
White shark foraging BIA[3]												
Scalloped hammerhead migration[4]												
Little penguin foraging[5]												
Wedge-tailed shearwater foraging[5]												
Caspian tern foraging[5]												
Pacific gull foraging[5]												
Bridled tern foraging[5]												
Roseate tern foraging[5]												
Fairy tern foraging[5]												
Green turtle												
Leatherback turtle												
Loggerhead turtle												

1 (Source: DoEE 2019), 2 (Source: McCauley & Jenner 2010; McCauley & Duncan 2011; Double et al. 2012; Double et al. 2014). 3 (DoE, 2019), 4 (Source: Lopez et al 2022), 5 (Source: DAWE 2021b, Higgins 2003, DoEE 2019).

10.5.1.1.1 Potential pressures to key marine fauna species

Although a number of conservation significant marine fauna species may occur in or proximate to South Thomson Bay, some of these species may either only occur within or within vicinity of the development envelope occasionally due to the lack of critical habitat for these species. While other species are unlikely to be susceptible to impacts or pressures from construction of the proposal.

Analysis of the potential pressures on selected protected species in the South-west Marine Region is provided in the Marine bioregional plan for the South-west Marine Region (DSEWPC, 2013). Of these species, those that potentially occur within vicinity of the development envelope are discussed in Table 51.

Table 51: Summary of pressures on selected protected species in the South-west Marine Region (DSEWPC, 2013)

Species group	Species addressed in Marine bioregional plan for the South-west Marine Region (DSEWPC, 2013)	Pressure relevant to the proposal										
		Physical habitat modification	Change in oceanography	Chemical pollution/ contaminants	Changes in turbidity	Noise pollution	Light pollution	Oil pollution	Entanglement with infrastructure	Changes in turbidity	Invasive species	Vessel collision
	Pressure of less or no concern											
	Pressure of potential concern											
	Pressure of concern											
Cetaceans	Humpback whale											
	Pygmy blue whale											
	Southern right whale											
Marine reptiles	Green turtle											
	Leatherback turtle											
	Loggerhead turtle											
Pinnipeds	Australian sea lion											
	New Zealand fur seal											
Seabirds	Fairy tern, Caspian tern and crested tern*											
	Wedgetailed shearwater											
	Little penguin											
Sharks	Grey nurse											
	White shark											

*It is considered likely, that although not included in the risk assessment, the Roseate tern is susceptible to similar pressures DSEWPC 2013

10.5.1.2 Temporary / permanent loss or degradation of habitat

Loss of marine fauna habitat, primarily the loss of seagrass species, as well as changes to marine environmental quality associated with construction of the proposal has the potential to result in indirect impacts to marine fauna species, including but not limited to fish and marine invertebrates, through loss of foraging opportunities, spawning and predator avoidance habitat. Recreational fishing in the bay may also be impacted by a decline in abundance of target fish species.

The total predicted loss of potential marine fauna habitat from implementation of the proposal is summarised below:

- Direct (permanent) impacts to 1.98 ha of mixed seagrass and 0.87 ha of sand / sand with wrack within the development envelope. The loss of 1.98 ha of mixed seagrass represents 0.5% of seagrass within the LAU.
- Direct (recoverable) impacts to 0.08 ha of mixed seagrass and 0.39 ha of sand / sand with wrack within the development envelope from the temporary mooring of construction vessels. The mooring of construction vessels is proposed within the portion of ZoMI which occurs within the development envelope. Mooring of construction vessels is unlikely to directly impact all of the 0.08 ha of seagrass within this area. However, for the purposes of this impact assessment, a conservative approach has been adopted and the entirety of the area has been included as a direct (temporary) impact. The temporary loss of 0.08 ha of mixed seagrass represents 0.02% of seagrass within the LAU.
- Indirect (recoverable) impacts to:
  - 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI will recover within a five-year period

5.13 ha of mixed seagrass, 1.13 ha macroalgae dominated community, 0.35 ha of limestone reef / pavement and 6.70 ha of sand / sand with wrack within the ZoI. Changes in environmental quality associated with dredge plumes in the ZoI are not predicted to result in a detectible impact on benthic biota.

As the permanent loss of 1.98 ha of mixed seagrass only accounts for 0.5% of mixed seagrass within the LAU, , the overall change of marine fauna habitat resulting from the proposal is low in a regional context and the potential impacts to marine fauna species which use these benthic environments for habitat is also predicted to be low.

The temporary loss of 0.08 ha of mixed seagrass within the development envelope due to mooring of vessels during construction represents 0.02% of seagrass within the LAU. Research indicates that recovery from mechanical disturbances (such as the proposed temporary mooring) to seagrass can take between 1 to 25 months (Neus Sanmartí, 2021). However, as these direct impacts are located within the modelled ZoMI, recovery of impacts to benthic communities and habitats within this area is anticipated to take up to 5 years.

The ZoMI is the area within which predicted impacts on benthic organisms are recoverable within a period of five years following completion of the dredging activities. The mixed seagrass habitat within the ZoMI comprises 2.62 ha, which accounts for 0.65% of the LAU. Given the limited extent of the ZoMI in comparison to the LAU, the temporary changes to marine environmental quality within the ZoMI are unlikely to significantly reduce the abundance of marine fauna species regionally in the LAU.

The ZoI is associated with temporary changes in environmental quality from dredge plumes. Although marine fauna habitats within the modelled extent of the ZoI will be exposed to effects of dredging and construction, these will be minor and no observable impacts are predicted.

10.5.1.3 Temporary increase in turbidity

In addition to the temporary and recoverable impacts to benthic communities and habitats from an increase in TSS (discussed in Section 10.5.1.1), a temporary increase in TSS within the ZoMI and ZoI has the potential to result in behavioural changes to marine fauna and impacts to benthic marine organisms. These behavioural changes may include avoidance behaviours and changes in foraging behaviour. As outlined in Section 10.5.1.1.1, this is considered a pressure of less or no concern for the protected marine fauna species of the South-west Marine Region. As such, this is considered unlikely to comprise a significant impact.

Dredging impacts to benthic marine organisms, including infauna (e.g., polychaetes, crustaceans, bivalves) and epifauna (e.g., sponges, echinoderms, gastropods, decapods) may occur through smothering or scouring as a result of sedimentation (Pineda, 2017). In addition, a reduction in light availability may occur as a result of increased suspension of sediments. Phototrophic marine organisms and those with limited mobility are particularly at risk from these dredging impacts (Fraser et al, 2017).

Increased turbidity can also have an indirect impact to benthic marine organisms by affecting the habitat in which they live (e.g. seagrass). Seagrass supports a range of small mobile macrofauna and epiphytes (Jernakoff, 1996), and loss of seagrass will result in loss or changing distribution of these communities. Impacts to seagrass is discussed further in Section 7.5.1.1.

An assessment of the vulnerability of marine invertebrate species to dredging activities was undertaken by Short J et al (2017). The impact of sedimentation on sessile invertebrates depends on a range of factors, such as morphology, reproductive strategies and feeding strategies as outlined in Table 52. No conservation significant marine invertebrate species have been identified within vicinity of the proposal. Therefore, as this impact will be localised to the modelled ZoMI and ZoI and will not impact conservation significant species, it is not considered significant.

Table 52: Characteristics used to determine vulnerability to dredging marine invertebrates (Short J et al 2017)

Marine invertebrate characteristic	Vulnerability		
	High	Medium	Low
Feeding strategy	Autotrophs/filter feeders	Grazers/predators	Deposit feeders
Movement	Sessile	Weakly mobile	Mobile
Lifespan	Short-lived	-	Long-lived
Reproductive strategy	Semelparous	-	Iteroparous
Reproductive season	Discrete	-	Protracted
Development strategy	Brooders	Lecitho- /planktotrophs	Asexual

10.5.1.4 Risk of injury or death from rock dumping during breakwater construction

Rock dumping during the breakwater construction has the potential to result in the following impacts (EPA, 2016j):

- Rock dumping may impact marine fauna through increases in turbidity and the mobilisation of contaminants located within the sediment. These impacts are discussed further in Section 9 of this report and are not considered likely to have a significant impact on marine fauna.
- Underwater noise generated from rock dumping may negatively impact marine fauna either through physical injury or avoidance behaviours. Underwater noise generated from rock dumping is anticipated to be less than that generated by piling and dredging activities. Potential underwater noise impacts on marine fauna are discussed further in Section 10.5.1.5.

Further impacts to marine fauna from construction of the breakwater includes the potential for injury or death from rock dumping.

10.5.1.5 Elevated underwater noise

Some marine fauna species use sound for foraging, orientation, communication, navigation, echo-location of prey and predator avoidance (Richardson, 1995) and therefore may be affected by high levels of underwater noise. High levels of anthropogenic underwater sound can have negative impacts, ranging from changes in acoustic communication, displacement from an area, and in more severe cases temporary hearing loss, physical injury or mortality (Richardson, 1995).

As outlined in Section 10.5.1.1.1, the Australian sea lion, whales (humpback whale, pygmy blue whale, southern right whale) and sea turtles (green turtle, leatherback turtle, loggerhead turtle) may be susceptible to underwater noise impacts. Other species that may occur within vicinity of the development envelope and which may be impacted by underwater noise but are not listed as conservation significant species includes dolphins and fish.

10.5.1.5.1 Underwater noise sources from the proposal

The greatest source of noise from the proposal will be associated with piling during construction. Pile driving will be required as part of the construction of the proposal. Other construction activities proposed are expected to emit similar levels of underwater noise (e.g. dredging) or less (e.g. vessel movements and rock dumping) to that modelled for the piling activities. As such, the underwater noise assessment included assessment of the activities most likely to impact marine fauna.

It is estimated that approximately 20 piles will be driven into the seabed on the leeward side of the rock groyne. The piles will be driven using a vibro hammer with a ram weight of 2.06 tonnes and a maximum vibration frequency of 3,000/minute. The steel tubular piles are likely to be approximately 500 mm to 600 mm

in diameter and the rate of installation is estimated to be one to two piles per day. The estimated duration of pile driving is approximately 15 days.

Piling is proposed to be undertaken using a vibro hammer rather than impact piling methods to minimise potential impacts to marine fauna. Piling noise varies depending on the piling method and size of the pile being installed. A summary of the vibro hammer and impact hammer methods is provided below:

- Impact hammer – impulsive in character with multiple pulses occurring at blow rates in the order of 30 to 60 impacts per minute. Typical source levels range from sound exposure level (SEL) 170–225 dB re 1 µPa2s for a single pulse, and peak level 190–245 dB re 1 µPa. Most of the sound energy usually occurs at lower frequencies between 100 Hz and 1 kHz. Factors that influence the source level include the size, shape, length and material of the pile, the weight and drop height of the hammer, and the seabed material and depth
- Vibro-hammer – continuous in character and usually of a much lower level than impact piling. Typical source levels range from sound pressure level (SPL) 160–200 dB re 1 µPa, with most of the sound energy occurring between 100 Hz and 2 kHz. Strong tones at the driving frequency and associated harmonics may occur with the driving frequency typically ranging between 10 and 60 Hz. Sound propagation at such low frequencies is often poor in shallow water environments, such that the tones may not be noticeable at greater distances from the source (Government of South Australia, 2012).

Although vibro-piling is proposed, there is contingency for conventional impact hammer pile driving of some piles if they reach the point of refusal before the target depth is achieved. The probability of needing conventional pile driving is very low given that the recent pile driving work conducted on Rottnest Island jetty (approximately 800 m north-west of this project) was successfully completed to similar target depths only using a vibro hammer pile driver.

Both the proposed vibro-piling (scenario 2) and contingency hammer piling (scenario 1) were modelled in the underwater acoustic assessment ((Tetra Tech, 2024) (Appendix S) in case the contingency of hammer piling is required during construction of the proposal. The results from modelling these scenarios are discussed in Section 10.5.1.2.4.

As outlined in Section 10.5.1.1.1, the Australian sea lion, whales (humpback whale, pygmy blue whale, southern right whale) and sea turtles (green turtle, leatherback turtle, loggerhead turtle) may be susceptible to underwater noise impacts. Other species that may occur within vicinity of the development envelope and which may be impacted by underwater noise but are not listed as conservation significant species includes dolphins and fish.

10.5.1.5.2 Assessment criteria

The assessment criteria used in this assessment includes:

- The National Oceanic and Atmospheric Administration’s (NOAA’s) ‘Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing’ (NOAA, 2018)
- Criteria and Thresholds for U.S. Navy Acoustics and Explosive Effect Analysis (Jenkins, 2017).

The assessment criteria for each fauna type are divided into noise levels that may result in Temporary Threshold Shift (TTS), Permanent Threshold Shift (PTS) and behavioural shifts. The noise levels at which TTS and PTS occur is dependent on whether the noise being generated is impulsive or non-impulsive. The definitions of these two categories are:

- Impulsive – sounds produced are typically transient, brief (less than one second), broadband and consist of high peak pressure with rapid rise time and rapid decay. This noise source is associated with activities such as pile driving, seismic activities and underwater blasting and results in some of the most powerful sounds produced underwater.
- Non-impulsive – sounds produced can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent and typically do not have the high peak sound pressure with rapid rise / decay times that impulsive sounds do. This noise is associated with activities such as dredging, vessel operations, drilling and some construction activities.

The assessment criteria used for the marine fauna likely to occur within vicinity of the proposal in the underwater noise assessment are summarised in Table 53 and Table 54.

Table 53: Thresholds for non-impulsive and impulsive noise – marine mammals

Marine fauna type	Hearing group	Hearing bandwidth	Impulsive sounds			Non-impulsive sounds		
			PTS onset	TTS onset	Behaviour	PTS onset	TTS onset	Behaviour
Whales	Low frequency (LF) cetaceans. This group consists of the baleen whales (masticates).	7 Hz to 35 kHz	219 dB ($L_{p,pk}$) 183 ($L_{E, LF, 24h}$)	213 dB ($L_{p,pk}$) 168 dB ($L_{E, LF, 24h}$)	160 dB (L_p)	199 dB ($L_{E, LF, 24h}$)	179 dB ($L_{E, LF, 24h}$)	120 dB (L_p)
Dolphins and toothed whales	Mid frequency cetaceans (MF) Includes most of the dolphins, all toothed whales except for Kogia spp. and all the beaked and bottlenose whales.	150 Hz to 160 kHz.	230 dB ($L_{p,pk}$) 185 dB ($L_{E, MF, 24h}$)	224 dB ($L_{p,pk}$) 170 dB ($L_{E, MF, 24h}$)		198 dB ($L_{E, MF, 24h}$)	178 dB ($L_{E, MF, 24h}$)	
Sea lions	Otariids Underwater Includes sea lions and fur seals.	60 Hz to 39 kHz	232 dB ($L_{p,pk}$) 203 dB ($L_{E, OW, 24h}$)	226 dB ($L_{p,pk}$) 188 dB ($L_{E, OW, 24h}$)		219 dB ($L_{E, OW, 24h}$)	199 dB ($L_{E, OW, 24h}$)	

LE, 24h = cumulative sound exposure over a 24-hour period (dB re 1 µPa2·s).

Lp,pk = peak sound pressure (dB re 1 µPa).

Lp = root mean square sound pressure (dB re 1 µPa)

(Tetra Tech, 2024)

Table 54: Thresholds for non-impulsive and impulsive noise – fish and sea turtles

Marine fauna type	Impulsive sounds		Non-impulsive sounds		
	Injury	TTS onset	Injury	TTS onset	Behaviour
Fishes	206 dB ($L_{p,pk}$) 187 dB ($L_{E, 24h}$)	-	-	-	150 dB (L_p)
Sea turtles	232 dB ($L_{p,pk}$) 204 dB (LE, TUW, 24h)	226 dB ($L_{p,pk}$) 189 dB (LE, TUW, 24h)	220 dB (LE, TUW, 24h)	200 dB (LE, TUW, 24h)	175 dB (Lp)
	Impulsive sounds			Non-impulsive sounds	
	Mortality and potential mortal injury	Recoverable injury	TTS	Recoverable injury	TTS
Fishes without swim bladders	> 213 dB ($L_{p,pk}$) > 219 dB ($L_{E, 24h}$)	> 213 dB ($L_{p,pk}$) > 216 dB ($L_{E, 24h}$)	> 186 dB ($L_{E, 24h}$)	–	–
Fishes with swim bladder not involved in hearing	207 dB ($L_{p,pk}$) 210 dB ($L_{E, 24h}$)	207 dB ($L_{p,pk}$) 203 dB ($L_{E, 24h}$)	>186 dB ($L_{E, 24h}$)	–	–
Fishes with swim bladder involved in hearing	207 dB ($L_{p,pk}$) 207 dB ($L_{E, 24h}$)	207 dB ($L_{p,pk}$) 203 dB ($L_{E, 24h}$)	186 dB ($L_{E, 24h}$)	170 dB (L_p)	158 dB (L_p)
Eggs and larvae	207 dB ($L_{p,pk}$) 210 dB ($L_{E, 24h}$)	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low	–	–

LE, 24h = cumulative sound exposure over a 24-hour period (dB re 1 µPa2·s).

Lp,pk = peak sound pressure (dB re 1 µPa).

Lp = root mean square sound pressure (dB re 1 µPa)

PTS = permanent threshold shift.

N = near (10s of meters).

I = intermediate (100s of metres).

F = far (1000s of metres).

– = not applicable

(Tetra Tech, 2024)

10.5.1.5.3 Underwater noise assessment

The underwater acoustic assessment was undertaken for two separate scenarios:

- **Proposed piling method**: Vibratory hammer installation for a 24-inch pile diameter
  - Vibratory piling reduces the potential underwater noise impacts to marine fauna species during the installation of piles when compared to using impact hammers. The type and classification of the sound that is generated with vibratory versus impact pile driving is different. The sound generated from vibratory pile driving is a more non-impulsive, continuous sound as opposed to the impulsive and sharp sounds produced from impact pile driving. A vibratory hammer will be used for the installation of new piles
- **Contingency piling method**: Impact pile driving installation for a 24-inch pile diameter
  - Impact pile-driving involves weighted hammers that pile drive foundations into the sea floor
  - The acoustic energy is created upon impact, where the energy travels into the water along different paths. Near the pile, acoustic energy arrives from different paths with different associated stage and time lags, which creates a pattern of destructive and constructive interference. Further away from the pile, the water- and sea floor-borne energy are the dominant pathways
    - From the top of the pile where the hammer hits, through the air, into the water
    - From the top of the pile, down the pile, radiating into the air while traveling down the pile, from air into water
    - From the top of the pile, down the pile, radiating directly into the water from the length of pile below the waterline
    - Down the pile radiating into the ground, traveling through the ground and radiating back into the water.

It is likely that the piling will be undertaken after construction of the proposed breakwater. As such, the underwater noise assessment provides a worst-case scenario, as it is likely that the underwater noise will be somewhat dampened by the infrastructure.

The outcomes from the underwater acoustic assessment are summarised in Table 55. Figure 39 and Figure 40 show the unweighted and unmitigated underwater received sound pressure levels for each scenario. Underwater sound pressure level ranges are displayed in 5 dB increments and sound propagation characteristics are shown, as applicable.

Table 55: Injury and Behavioural Onset Criteria Threshold Distances (meters) for Vibratory Hammer Pile Installation (proposed method) and Impact Pile-Driving (contingency method)

Hearing group	Metric	PTS		TTS		
		Threshold (dB)	Distance (m)	Threshold (dB)	Distance (m)	
Proposed piling method						
Vibratory hammer installation for a 24-inch pile diameter						
Low-frequency cetaceans	$L_{E,24hr}$ [1,2]	199	The threshold level is greater than the source level; therefore, distances are not generated.	179	19	For the PTS thresholds, the smallest distances to thresholds were observed for the SEL acoustic thresholds while the largest distances were observed for the 120 dB SPL Marine Mammal criteria. The largest distance was modelled to be 167 m corresponding to the 120 dB SPL criterion. For the TTS thresholds, the largest distances were observed for the 179 dB SPL low frequency cetacean criteria. The largest distance was modelled to be 179 m.
Mid-frequency cetaceans	$L_{E,24hr}$ [1,2]	198		178	The threshold level is greater than the source level; therefore, distances are not generated.	
Otariid pinnipeds underwater	$L_{E,24hr}$ [1,2]	219		199		
Marine mammal behaviour	L_p [1,3]	120	167	-	-	
Sea turtle temporary threshold shift	$L_{E,24hr}$ [1/,2/]	200	The threshold level is greater than the source level; therefore, distances are not generated.	-	-	There were not associated distances because the thresholds are greater than the source level.
Sea turtle permanent threshold shift	$L_{E,24hr}$ [1/,2/]	220		-	-	
Sea turtle behavioural	L_p [2/]	175		-	-	
Small fish	$L_{E,24hr}$ [3,4]	183	16	-	-	All distance to threshold values were low (i.e. less than 50 metres). The largest distance of 21 metres occurred for unmitigated distance to the 183 dB SEL acoustic threshold for the vibratory installation.
	L_p [5]	150	6	-	-	
Large fish	$L_{E,24hr}$ [3,4]	187	21	-	-	
	L_p [5]	150	6	-	-	
Contingency piling method						
Impact pile driving installation for a 24-inch pile diameter. Impact Hammer Energy: 70 kJ						
Low-frequency cetaceans	$L_{E,24hr}$ [1,3]	183	73	168	404	For the PTS criteria, the smallest distances to thresholds were observed for the peak sound pressure (Lpk) acoustic thresholds while the largest distances were observed for the 160 dB SPL for the marine mammal behavioural criteria. The largest distance was modelled to be 84 metres corresponding to the 160 dB SPL marine mammal behavioural criterion without mitigation for the impact installation of the 24-inch pile diameter. For the TTS criteria, the smallest distances to thresholds were observed for the Lpk acoustic thresholds. The largest distance was modelled to be 404 metres corresponding to the 168 dB threshold.
	$L_{p,pk}$ [1,3]	219	The threshold level is greater than the source level; therefore, distances are not generated.	213	The threshold level is greater than the source level; therefore, distances are not generated.	
Mid-frequency cetaceans	$L_{E,24hr}$ [1/,3/]	185		170	36	
	$L_{p,pk}$ [1/,3/]	230		224	The threshold level is greater than the source level; therefore, distances are not generated.	
Otariid pinnipeds underwater	$L_{E,24hr}$ [1/,3/]	203		188	25	
	$L_{p,pk}$ [1/,3/]	232		226	The threshold level is greater than the source level; therefore, distances are not generated.	
Marine mammal behaviour	L_p [2,4]	160	84	-	-	
Sea turtle temporary threshold shift	$L_{E,24hr}$ [1/,2/]	189	30	-	-	All distance to threshold values were low (i.e. less than 50 metres). The largest distance was modelled to be 37 metres.
	$L_{p,pk}$ [1/,2/]	226	The threshold level is greater than the source level; therefore, distances are not generated.	-	-	
Sea turtle permanent threshold shift	$L_{E,24hr}$ [1/,2/]	204	3	-	-	
	$L_{p,pk}$ [1/,2/]	232	The threshold level is greater than the source level; therefore, distances are not generated.	-	-	
Sea turtle behavioural	L_p [2/]	175	37	-	-	
Fish: no swim bladder	$L_{E,24hr}$ [1,2]	219	The threshold level is greater than the source level; therefore, distances are not generated.	-	-	All distance to threshold values were low (i.e. less than 100 metres) except for the distance to the 150 dB SPL behavioural threshold criteria. The largest distance was modelled to be 348 metres.
	$L_{p,pk}$ [1,2]	213		-	-	
Fish: swim bladder is not involved in hearing	$L_{E,24hr}$ [1,2]	210		-	-	
	$L_{p,pk}$ [1,2]	207		-	-	
Fish: swim bladder involved in hearing	$L_{E,24hr}$ [1,2]	207	4	-	-	
	$L_{p,pk}$ [1,2]	207	The threshold level is greater than the source level; therefore, distances are not generated.	-	-	
Eggs and larvae	$L_{E,24hr}$ [1,2]	210		-	-	
	$L_{p,pk}$ [1,2]	207		-	-	
Small fish	$L_{E,24hr}$ [3,4]	183	76	-	-	
	$L_{p,pk}$ [3,4]	206	2	-	-	
	L_p [5]	150	348	-	-	
Large fish	$L_{E,24hr}$ [3,4]	187	52	-	-	
	$L_{p,pk}$ [3,4]	206	2	-	-	
	L_p [5]	150	348	-	-	

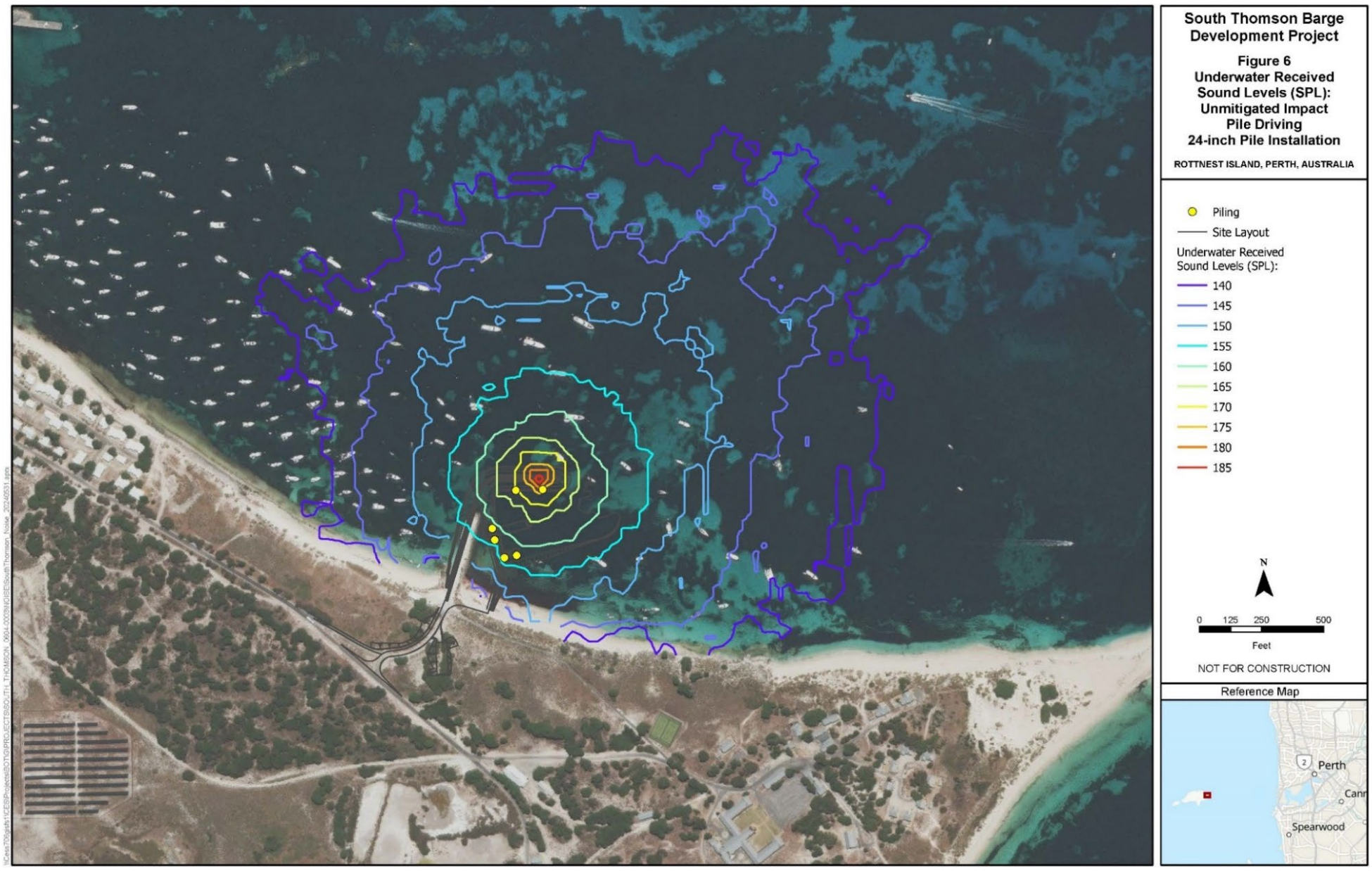


Figure 39: Underwater Received Sound Levels (SPL): Unmitigated impact pile driving 24-inch pile installation (contingency piling method)

Figure 40: Underwater Received Sound Levels (SPL): Unmitigated vibratory 24-inch pile installation (proposed piling method)

10.5.1.6 Increased vessel collision risk

An increased risk of collision could result from an increase in the number of vessels using the South Thomson Bay Barge Landing during operation and to a lesser degree during construction of the proposal. As outlined in Section 10.5.1.1.1, marine fauna species that may be susceptible to vessel strike includes turtle and whale species. As discussed previously, marine turtle species are considered likely to only occasionally occur within or proximate to the development envelope and the risk of whale species occurring in these shallow waters is low. As such, the risk of vessel strike impacting these species within the development envelope is low. There is however a risk of strikes between whales and vessels during vessel movements between the mainland and island.

The operation of the proposal will result in an increase in vessel activity within and within vicinity of the development envelope. Vessel collisions with marine fauna have the potential to result in injury or death to the affected animal. Vessels travelling at 14 knots or faster are those most likely to cause death or serious injury to marine mammals (Wilson, 2007). In addition, there is the potential for the increase in vessel activity to disturb marine fauna, potentially interrupting key activities (e.g. foraging) or displacing animals from preferred habitat.

The risk of vessel strike during construction activities is low as the construction vessels will operate slowly and within the development envelope only. The CEMP will outline speed limits and other management measures to ensure the risk of vessel strike during construction is minimised.

Barge movements already occur between the mainland and Main Jetty in Thomson Bay. Therefore, the proposal will not result in any increased risk of vessel strike. The OEMP outlines measures to further reduce this risk (Appendix Q).

10.5.1.7 Increased risk of entanglement or entrainment

Activities involved in the construction and operation of the proposal have the potential to cause both entanglement and entrainment to marine fauna. Entanglement may lead to injury, death, displacement, adverse behavioural and physiological changes. As outlined in Section 10.5.1.1.1, marine fauna species that may be susceptible to injury from entanglement includes the Australian sea lion and southern right whale. Sea turtles are likely to be susceptible to entrainment, however as discussed previously, marine turtles are unlikely to frequent the area.

Building materials and general litter associated with the construction and operational phases of the proposal have the potential to cause entanglement. Several factors including the visibility, dimensions, how important the location is for feeding or breeding and the extent of close-range evasion all interact to determine the likelihood of entanglement.

Entrainment, the direct uptake of aquatic organisms by suction, during activities such as dredging has the potential to cause mortality to marine fauna species (Dabble, 2012).

10.5.1.8 Increased risk of introduced marine species

There is a risk of introduced marine species (IMS) during construction and operation of the proposal from vessel ballast water and hull fouling. IMS may threaten biodiversity through a number of mechanisms such as predation, competition for habitat and altering ecosystems.

Implementation of the proposal would not result in a major change in the activities that already exist on Wadjemup / Rottnest Island as the proposal involves moving the barging facilities to the proposed location from the existing jetty, rather than introducing a new activity to the island. The CEMP and OEMP outlines management measures to ensure that the risk of IMS is minimised and as such there would not be any increase in the existing level of IMS occurring proximate to the proposal.

10.5.1.9 Increased light emissions

Increased light emissions during operation of the proposal could lead to disturbance to marine fauna in the vicinity, especially shorebirds and seabirds. Fairy terns roost at Phillip Point, approximately 800 m to the east of the proposal. Lighting has not been shown to impact fairy terns, however night-time lighting near fairy tern habitat can increase feeding opportunities for silver gulls, resulting in competition for food sources (DEWHA, 2011).

The potential for artificial light emissions to impact shorebirds and seabirds during construction is considered to be low, as construction works will be undertaken during nominated daylight hours, with likely lighting requirements limited to security / safety installations.

The OEMP will ensure light emission impacts on shorebirds and seabirds is minimised and in accordance with the National Light Pollution Guidelines for Wildlife (DCEEW, 2023).

10.5.1.10 Increased risk of pollution incidents

Increased boat numbers during operation, and to lesser degree construction, of the proposal has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage.

An increase in vessels using South Thomson Bay is expected during the operational phase, and quantities and types of material that might enter the marine environment are limited to spills relating to these vessels. The magnitude of this impact is entirely dependent upon the quantities and nature of the spillage, the dilution and dispersal properties of the waters and the bioavailability of the contaminant to species. The more toxic components of fuel spills are volatile and relatively short-lived. Heavier hydrocarbons, while less toxic, may persist for longer in the marine environment.

Whilst marine fauna such as seabirds, marine mammals and elasmobranchs are likely to be able to detect and avoid pollutants, sessile species of shellfish are potentially more vulnerable. Likely effects of release of contaminants into the marine environment may result in direct impacts through ingestion, inhalation and absorption through the skin, and abandonment of polluted feeding habitat and potentially longer-term impacts from bioaccumulation in the food chain.

10.6 Mitigation

Table 56 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of marine fauna to address the key potential impacts.

Table 56: Application of mitigation hierarchy to marine fauna

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Temporary / permanent loss or degradation of benthic habitat	Direct and Indirect	Avoid	• Avoiding construction activities during known critical spatial and temporal windows of marine environmental sensitivity will avoid significant impacts to marine fauna species. These critical windows are outlined in Table 50. However, it is not anticipated that impacts to marine species can be fully avoided during construction activities. • Site selection includes an already disturbed area of 0.19 ha of seabed within the existing Army Groyne footprint. As benthic communities and habitats are widespread within South Thomson Bay, total avoidance of direct impacts is not possible. • RIA amended the project design to reduce the dredging requirements. By changing the berthing and barge turn pocket, the volume of required dredging was reduced from 26,000 m^3 to 16,050 m^3	**Direct (permanent) impacts to 1.98 ha mixed seagrass and 0.87 ha sand with wrack within the development envelope.** **Direct (temporary) impacts to 0.08 ha mixed seagrass and 0.39 ha sand with wrack within the development envelope.** **The temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI.** Baird (2025b) predicts that temporary impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities. • Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address a temporary increase in TSS / turbidity during construction. • Implementation of these management plans ensures that impacts to marine environmental quality outside the ZoMI and ZoHI from a temporary increase in suspended sediments are unlikely. • Significant residual impacts to marine fauna from temporary/ permanent loss of potential fauna habitat and from reduced marine environmental quality are considered unlikely.
		Minimise	• Management and mitigation proposed during construction to minimise impacts to marine fauna habitat such as benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area of benthic habitat affected by suspended sediments during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI. – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of construction activities. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP. • The OEMP provides the monitoring and management framework for potential environmental impacts to marine fauna from the implementation of the proposal over the long-term operational life span of the marine structures. Key management measures outlined in the OEMP includes: – Benthic communities and habitat monitoring in accordance with the benthic communities and habitat monitoring program provided in the OEMP – Quarterly water quality sampling and annual sediment quality sampling over an annual reporting period for the first two years of operations and following this the frequency will be reviewed as necessary. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	
		Rehabilitate	There is no opportunity to rehabilitate the impacted area due to operation and maintenance of the proposal. Construction effects (outside the development envelope) to marine fauna habitat (benthic communities and habitats) will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Elevated underwater noise	Direct	Avoid	• Avoiding construction activities, such as dredging and piling, which generate underwater noise during known critical spatial and temporal windows of marine environmental sensitivity. Key windows of sensitivity, such as periods of whale migration, are discussed in Table 50. • Using vibro hammer piling methods (rather than hammer piling) will eliminate sources of impulsive noise.	**Underwater noise emissions from activities such as piling and dredging causing temporary disturbance to marine fauna species** • Potential for elevated underwater noise to impact marine fauna is limited to construction works. • Implementation of the CEMP provides the monitoring and management framework to address elevated underwater noise during piling. Significant residual impacts to marine fauna from elevated underwater noise are considered unlikely.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P) provides the monitoring and management framework to address elevated underwater noise generated from construction activities, such as dredging and piling. Implementation of this management plan will ensure that: – There is no injury or death of marine fauna associated with underwater noise generated during construction of the proposal. – There is no injury or death of marine fauna from underwater noise. • Key management and monitoring measures included in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) are: – Trained marine fauna observers (MFOs) will minimise the risk of injury to marine fauna during piling. – A reduction in underwater noise impacts to marine fauna will be achieved through the use of vibration piling rather than hammer piling during construction. The reduction in underwater noise levels can be seen in the comparison of the underwater noise modelling shown in Figure 39 and Figure 40. – Hammer piling will only be used as a contingency if there is a refusal during vibro-piling. Exclusion zones for this contingency are included in the CEMP. – Pre-start, soft-start, shut-down and low-visibility procedures will be implemented as outlined in the CEMP. These are summarised below and detailed in Appendix B of the CEMP: • Prior to piling works each day and for each pile, the dedicated MFOs will commence continuous visual observation within the observation and exclusion zones for 30-minutes. • Soft-start procedures involve the commencement of piling at low vibro-hammer energy, gradually increasing to full energy over a 30-minute period. Where target marine fauna are not observed in the observation and exclusion zones during the soft-start procedures, then normal piling can commence. • Where marine fauna is observed by the MFO within the observation zone (but outside the exclusion zone) during piling activities (including soft-start procedures), then the shutdown procedures outlined in the CEMP will be implemented. • During periods of low visibility (i.e. where a distance of 500 m cannot be clearly viewed), then piling operations may commence with soft-start procedures, unless one of the triggers provided in the CEMP occurs. – Implementation of observation and exclusion zones. These zones have been based on the underwater received sound levels and distances from the underwater noise assessment (Appendix S) and are	

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
			provided in the CEMP. The observation zones have been designed to encompass the modelled Temporary Threshold Shift (Section 10.5.1.5) and the exclusion zones have been designed to encompass the Permanent Threshold Shift (Section 10.5.1.5). The management zones are depicted in Appendix B (Marine Fauna Provisions) of the CEMP. – Piling will only be undertaken during daylight hours to ensure visibility of the observation and exclusion zones for the MFO. – Trained MFOs will be on duty (as outlined in Appendix B of the CEMP) on vessels during construction.	
		Rehabilitate	There is no opportunity to rehabilitate underwater noise impacts	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Increased vessel collision risk	Direct	Avoid	Marine vessels will be used during the construction and operation of the proposal. As such, there is no opportunity to completely avoid the risk of vessel collision.	**No residual impacts expected** • Implementation of the CEMP provides the monitoring and management framework to minimise the risk of increased vessel collision risk during construction. • Implementation of the OEMP provides the monitoring and management framework to address increased vessel collision risk during operation. • There is a low residual risk to marine fauna from vessel collision during construction and operation.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address increased vessel collision risk during construction. Implementation of this management plan will ensure that there is no death or injury to marine fauna from vessel strike. Management measures that will be implemented include: – Implementation of vessel speed limits. – All vessels are to adhere to standards set in the National Whale Watching Guidelines. – A MFO on all construction vessels when in transit. – Implementation of vessel approach distances to marine fauna. – Implementation of the marine fauna monitoring and management program provided in Appendix B.3 of the DEMMP. • Implementation of the OEMP (Emerge, 2025b) (Appendix Q) provides the monitoring and management framework to address increased vessel collision risk during operation. Implementation of this management plan will ensure that marine users to comply with vessel operational restrictions required by DoT and RIA.	
		Rehabilitate	There is no opportunity to rehabilitate increased vessel collision risks. Sick and/or injured fauna shall be managed by appropriately qualified personnel and any injury or death of marine fauna will be reported to DBCA.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Increased risk of entanglement and entrainment	Direct	Avoid	Dredging will be undertaken during construction and may also be required during operation. There is no opportunity to completely avoid increased risk of entrainment. Dredging will be undertaken during construction and may also be required during operation. Silt curtain sill be used during dredging to manage sediment plumes. There is the potential for entanglement of marine fauna in silt curtains and as such, there is no opportunity to completely avoid increased risk of entanglement.	**No residual impacts expected** • Potential for increased risk of entrainment to impact marine fauna limited to construction and maintenance dredging during operation. • Potential for increased risk of entanglement to impact marine fauna during construction and operations will be minimised through implementation of the CEMP, DEMMP and OEMP. • With implementation of the CEMP and OEMP, residual impacts to marine fauna from increased risk of entanglement and entrainment are not anticipated.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address increased risk of entanglement and entrainment during construction. Management measures to minimise the risk of injury to fauna during construction includes: – Dedicated MFOs during dredging will implement management measures to minimise the risk of injury to fauna. Where marine fauna are observed within an Exclusion Zone, dredging will cease immediately. – Prior to commencing dredging or excavating, dedicated MFOs will check for marine fauna within the exclusion and observation zones outlined in the CEMP. – Dredging activities will be undertaken during daylight hours only to improve visibility. – Measures to minimise the risk for entanglement of marine fauna with waste during construction. – Measures to minimise the risk for entanglement of marine fauna with construction equipment. • Implementation of the OEMP (Emerge, 2025b) (Appendix Q) provides the monitoring and management framework to address increased risk of entanglement during operation. During operation of the proposal, the risk of entanglement will be minimised through: – Installation of information-boards to encourage appropriate disposal of litter and the inform of the dangers of entanglement. – Waste disposal measures and prevent rubbish and litter.	
		Rehabilitate	There is no opportunity to rehabilitate increased risk of entanglement and entrainment. Sick and/or injured fauna shall be managed by appropriately qualified personnel and any injury or death of marine fauna will be reported to DBCA.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Risk of injury or death from rock dumping during breakwater construction.	Direct	Avoid	The risk for injury or mortality during rock dumping activities cannot be completely avoided.	**No residual impacts expected** • Potential for injury or mortality of marine fauna from rock dumping is limited to the construction phase. • With implementation of the CEMP, residual impacts to marine fauna from rock dumping are not anticipated.
		Minimise	• The CEMP (Emerge, 2025a) (Appendix P) outlines the management and monitoring measures to mitigate the potential impacts of rock dumping and excavation on conservation significant marine fauna. These measures include: – Dedicated MFOs during rock dumping activities will implement management measures to minimise the risk of injury to fauna as outlined in Appendix B (Marine Fauna Provisions) of the CEMP, including: ○ Prior to rock dumping and excavation works, the dedicated MFOs will commence continuous visual observation within the specified Management Zones for 30 minutes. If target marine fauna is observed within the management zone during this time, rock dumping and excavation shall be delayed until the marine fauna has been observed exiting the Observation Zone or have not been seen for 30 minutes. ○ Once rock dumping has commenced, if the dedicated MFOs observe a target marine fauna species within the Exclusion Zones then shut-down procedures will be implemented. ○ During periods of low visibility (i.e. where a distance of 500 m cannot be clearly viewed), then rock dumping and excavation activities may commence with soft-start procedures. – Rock dumping, dredging and excavation activities will be undertaken during daylight hours only to improve visibility.	
		Rehabilitate	There is no opportunity to rehabilitate increased risk of injury or mortality from rock dumping. However, sick and/or injured fauna shall be managed by appropriately qualified personnel and any injury or death of marine fauna will be reported to DBCA.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Increased risk of introduced marine species (IMS)	Indirect	Avoid	Marine vessels will be used during the construction and operation of the proposal and the risk of IMS cannot be completely avoided.	**No residual impacts expected** • With implementation of the CEMP and OEMP, residual impacts to marine fauna from increased risk of IMS are not anticipated.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and OEMP (Appendix Q) will minimise the risk of introduction of IMS. • The proposal will be primarily used for barge operations to transport bulk cargo to and from Wadjemup / Rottnest Island. As such, the likelihood of vessels visiting the facility from international, or interstate waters is low. However, any vessels from interstate or international waters will comply with Commonwealth biosecurity requirements and complete the WA Department of Primary Industries and Regional	

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
			Development 'Vessel Check' risk assessment (https://vesselcheck.fish.wa.gov.au). The risk assessment must indicate that the vessel poses a low risk of IMS. • All vessels will have a ballast water management plan and ballast water exchanges will be in accordance with IMS requirements and the *Commonwealth Biosecurity Act 2015*.	
		Rehabilitate	There is no opportunity to rehabilitate increased risk of introduced marine species.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Increased risk of pollution incidents	Indirect	Avoid	Construction and operation of the proposal includes vectors which have the potential to result in pollution incidents and risk of this impact cannot be avoided.	**No residual impacts expected** • Management and monitoring measures in the CEMP (Emerge, 2025a) (Appendix P), DEMMP (02 Environment, 2025) (Appendix O) and OEMP (Emerge, 2025b) (Appendix Q) will ensure that the residual pollution incident risk is low.
		Minimise	• Construction management measures to minimise the risk of pollution incidents which may impact marine fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the risk for hydrocarbon spills to the marine environment is minimal so that there are no adverse impacts to marine fauna. • Key management and monitoring measures include: – Implement industry standard hydrocarbon management practices (chemical handling, storage, segregation, and spill response) – Any construction vessels including piling vessels/barges to establish a sewage and garbage disposal plan – Undertake vessel maintenance and bunkering in accordance with contractors approved vessel management systems – Hydrocarbon spills into the marine environment be immediately reported and appropriately remediated. • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Appendix Q). Implementation of this management plan will ensure that: – Fuel / oil spill contingency plans are included in the OEMP and includes the provision of clean-up equipment and appropriate disposal of contaminated water and sediment – Pollution incidents will be reported to the DoT's MEER unit, with clean up managed and monitored in accordance with MEER's requirements – Pollution incidents will be monitored during operation in accordance with the OEMP, with contingency actions implemented should pollution triggers be breached on a reoccurring basis. • Should a spill occur, response, containment and cleanup will be undertaken in accordance with the Spill Prevention and Response Plan (RIA, 2025) provided as Appendix V. • The underground fuel storage facility will be constructed in accordance with AS1940 and as outlined in the OEMP have safety and leak detection equipment installed.	
		Rehabilitate	Fuel and oil spills to be cleaned up in accordance with the contingency actions outlined in the DEMMP, CEMP and OEMP (Emerge, 2025b) (Appendix Q). Sick and/or injured fauna shall be managed by appropriately qualified personnel.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Increased light emissions	Indirect	Avoid	• General construction work will be limited to daylight hours only.	**No residual impacts expected** • With implementation of the CEMP and OEMP, residual impacts to marine fauna from increased light emissions are considered low.
		Minimise	• Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to minimise impacts to marine fauna from increased light emissions during construction. The key management measure to ensure no disturbance to marine fauna from artificial light during construction is: – Construction activities will be restricted to daylight hours. • Operational management to minimise impacts to marine fauna is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Artificial lighting will be of lowest allowable intensity to meet legislative and regulatory requirements for human safety / navigational purposes. • Best practice lighting design consistent with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) will be employed to reduce light pollution on marine fauna during operation, including: – Only add light for specific purposes (e.g. navigational and safety) – Use adaptive light controls to manage light timing, intensity and colour – Light only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill – Use the lowest intensity lighting appropriate for the task – Use non-reflective, dark-coloured surfaces – Use lights with reduced or filtered blue, violet and ultra-violet wavelengths – Lighting will be directed to light specified areas of the facility – Lighting on the facility will be kept to a minimum that is required for safe operation for vessels and infrastructure.	
		Rehabilitate	There is no opportunity to rehabilitate increased light emissions.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	
Temporary increase in turbidity	Indirect	Avoid	• Avoiding construction activities during known critical spatial and temporal windows of marine environmental sensitivity will avoid significant impacts to marine fauna species. These critical windows are outlined in Table 50. However, it is not anticipated that impacts to marine species can be fully avoided during construction activities.	**A temporary increase in suspended sediments within the ZoI, ZoMI and ZoHI** Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address a temporary increase in TSS / turbidity during construction. Implementation of these management plans ensures that significant impacts to marine environmental quality outside the ZoMI and ZoHI from a temporary increase in suspended sediments are unlikely.
		Minimise	• Management and mitigation proposed during construction to minimise impacts to marine fauna habitat such as benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of construction activities. • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP for suspended sediment. • Implementation of the OEMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction. Key management and monitoring measures include: – A benthic infauna monitoring program – A quarterly water quality sampling and annual sediment quality sampling for the first two years of operations and following this the frequency will be reviewed as necessary. • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the Rottnest Barge Landing maintenance dredging framework (to be prepared prior to	

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
			maintenance activities being undertaken) and with the Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities.	
		Rehabilitate	• Increased turbidity within the ZoMI and ZoI will be temporary (with marine environmental quality returning to a High Level of Ecological Protection within two weeks following completion of construction activities). As such, no further rehabilitation is required.	
		Offset	Marine fauna offsets are not considered applicable to the proposal.	

10.7 Assessment and significance of residual impact

The predicted residual impacts to marine fauna from the proposal are considered manageable through implementation of the CEMP, DEMMP and OEMP. With implementation of these management plans, the residual impacts are not considered significant and are limited to:

- Impacts to the following benthic communities and habitats within the development envelope and ZoMI from an increase in suspended sediments results in a decrease in potential marine fauna habitat available:
  - Direct (permanent) impacts to 1.98 ha of mixed seagrass and 0.87 ha of sand / sand with wrack within the development envelope
  - Direct (recoverable) impacts to 0.08 ha of mixed seagrass and 0.39 ha of sand / sand with wrack within the development envelope from the mooring of construction vessels
  - Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI.
- Underwater noise emissions from construction activities such as piling and dredging causing temporary disturbance to marine fauna species.

These residual impacts are not considered significant as discussed in Table 57.

Table 57: Consideration of the significance of the residual impacts on marine fauna

Matters for consideration	Response
The object and principles of the EP Act	A Marine Fauna and Benthic Habitat Assessment (RPS, 2024a) was undertaken to address the EPA's marine fauna objective and the principles of the EP Act have been specifically addressed in relation to the proposal (Table 26).
Values, sensitivity and quality of the environment which is likely to be impacted	Sensitive receptors include marine fauna species, such as whales, which are known to transit through the marine environment during important breeding periods as discussed further in the Marine Fauna Desktop Study (Appendix B). Loss of 2.85 ha of marine fauna habitat (benthic communities and habitats) will occur from construction of the proposal. This impact is considered small scale when considered regionally (loss of mixed seagrass of 1.98 ha accounts for 0.5% of mixed seagrass within the LAU). Implementation of the CEMP, DEMMP and OEMP will avoid and minimise environmental impacts on the more sensitive benthic communities and habitats receptors (e.g. seagrass). With the proposed mitigation and management framework outlined in these management plans, the residual impact from the proposal is considered manageable.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	The predicted residual impacts to marine fauna from the proposal are considered to be manageable through implementation of the CEMP, DEMP and OEMP.
Resilience of the environment	The impact assessment identified that the marine fauna populations within vicinity of the proposal will be resilient to any changes as: • Best practice lighting design consistent with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023) will be employed to reduce light pollution on marine fauna. • Potential underwater noise impacts from piling are restricted to temporary behavioural responses of individuals, such as avoidance. This avoidance is not expected to displace individuals from critical habitat and therefore, impacts are not considered likely to be significant and marine fauna will be resilient to potential impacts from the proposal.

Matters for consideration	Response
	• With implementation of the CEMP, no significant impacts are expected from entanglement or entrainment and therefore the environment is considered resilient. • Significant impacts from IMS are not predicted, due to the management measures outlined in the CEMP and OEMP. Therefore, the environment is considered resilient. • Direct impacts to benthic communities and habitats are limited to 0.52% of mixed seagrass within the LAU. Indirect impacts within the ZoMI will be recoverable within a period of five years and impacts within the ZoI are not predicted to be observable. As such, it is considered that the marine environment is resilient to the indirect impacts from the proposal.
Consequence of the application of the mitigation hierarchy to the proposal.	The WA Offsets Guidelines (Government of Western Australia 2014) identifies four levels of significance for residual impacts: • Unacceptable impacts – those impacts which are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset. • Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level. • Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement • Impacts which are not significant – impacts which do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset Following the application of the mitigation hierarchy (Table 56) and taking into consideration the above significance of residual impacts model, RPS considers that there are no significant residual impacts to marine fauna from the proposal.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment and investigations relevant to marine fauna has been undertaken in accordance with relevant legislation and guidelines as per Table 47. A such, there is a high level of confidence in the predictions of residual impacts on marine fauna.
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

10.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to marine fauna are:

- **Environmental outcomes for construction of the proposal:**
  - Irreversible impacts to marine fauna habitat are limited to the wharf structure and ZoHI.
  - No reported introduction or establishment of IMS as a result of construction activities associated with the proposal.

  - No reported impacts to marine fauna as a result of hydrocarbon spill or release of waste associated with construction activities, including entanglement or ingestion of waste.
  - No reported behavioural changes which are known to be associated with distress or injury of marine fauna, health impacts (including temporary or permanent hearing loss), physical injury or mortality from underwater noise emissions from construction activities to significant marine fauna species.
  - No reported death or injury to marine fauna from vessel strike within the Rottnest Island Marine Reserve Boundary which is associated with the Rottnest Barge Landing Development construction.
  - No changes in marine fauna behaviour attributable to the construction lighting requirements of the proposal.
- **Environmental outcomes for operation of the proposal:**
  - No reported loss of marine fauna habitat outside of the development envelope attributable to the operations of the proposal.
  - No reported introduction or establishment of IMS as a result of operational activities associated with the proposal.
  - No reported impacts to marine fauna as a result of hydrocarbon spill or release of waste associated with operational activities including entanglement or ingestion of waste.
  - No reported death or injury to marine fauna from vessel strike or other activities within the Rottnest Island Marine Reserve Boundary associated with operational activities.
  - No changes in marine fauna behaviour attributable to the lighting requirements of the Proposal associated with operations.

Monitoring will be undertaken, and adaptive management measures implemented in accordance with the CEMP, DEMMP and OEMP to ensure these environmental outcomes are met.

As the impact assessment identified low residual risks to marine fauna following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet this the EPA's objective to protect marine fauna so that biological diversity and ecological integrity are maintained.

11 FLORA AND VEGETATION

11.1 EPA objective

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

11.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process.

Table 58 lists relevant EPA guidance, other state and Commonwealth legislation / policy, and provides consideration for how these documents informed the proposal.

Table 58: Relevant legislation, policy and guidance

Legislation, policy and guidance	Consideration
Environmental Factor Guideline – Flora and Vegetation (EPA, 2016a)	The environmental factor guideline identifies the environmental values of flora and vegetation, and their significance. These considerations were underpinned as part of the impact assessment on terrestrial flora and vegetation summarised in Section 11 of this report. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and OEMP (Emerge, 2025b) (Appendix Q) provides the monitoring and management framework to address potential impacts to flora and vegetation from construction and operation of the proposal.
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b)	Flora and vegetation surveys, as summarised in Section 11.3, have been undertaken within the development in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b). The EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) states that 'a reconnaissance survey is required where flora and vegetation values are well defined, the area is not likely to support significant flora or vegetation and the scale and nature of the potential impacts are not likely to be significant'. RPS considered these criteria to be met and that the small size of the site precluded the implementation of a detailed survey using quadrats.
Environment Protection and Biodiversity Conservation Act 1999	A search of DCCEEW's PMST was undertaken within a 5 km radius of the proposal to determine the MNES that are either known or likely to occur proximate to the proposal (Appendix R). A discussion of potential impacts on MNES is discussed in Section 14.2.
Biodiversity Conservation Act 2016	A search of the DBCA's NatureMap database was undertaken to determine a list of conservation significant terrestrial flora species and ecological communities that have been recorded within 10 km of the proposal (Appendix R).

11.3 Environmental investigations

A reconnaissance survey was undertaken by RPS within the terrestrial survey area shown in Figure 41 (Appendix J). As part of the reconnaissance survey, a review of the Focused Vision Consulting (FVC, 2023) report; Flora and Vegetation Survey South Thomson and Kingstown, Wadjemup / Rottnest Island (Appendix I) was undertaken. The FVC survey encompassed the development envelope and surrounding areas as shown in Figure 42.

The flora and vegetation data collected by RPS during the reconnaissance survey has been used to support this referral document and Section 11.5 provides a summary of this information.

Figure 41: Terrestrial flora and vegetation survey area

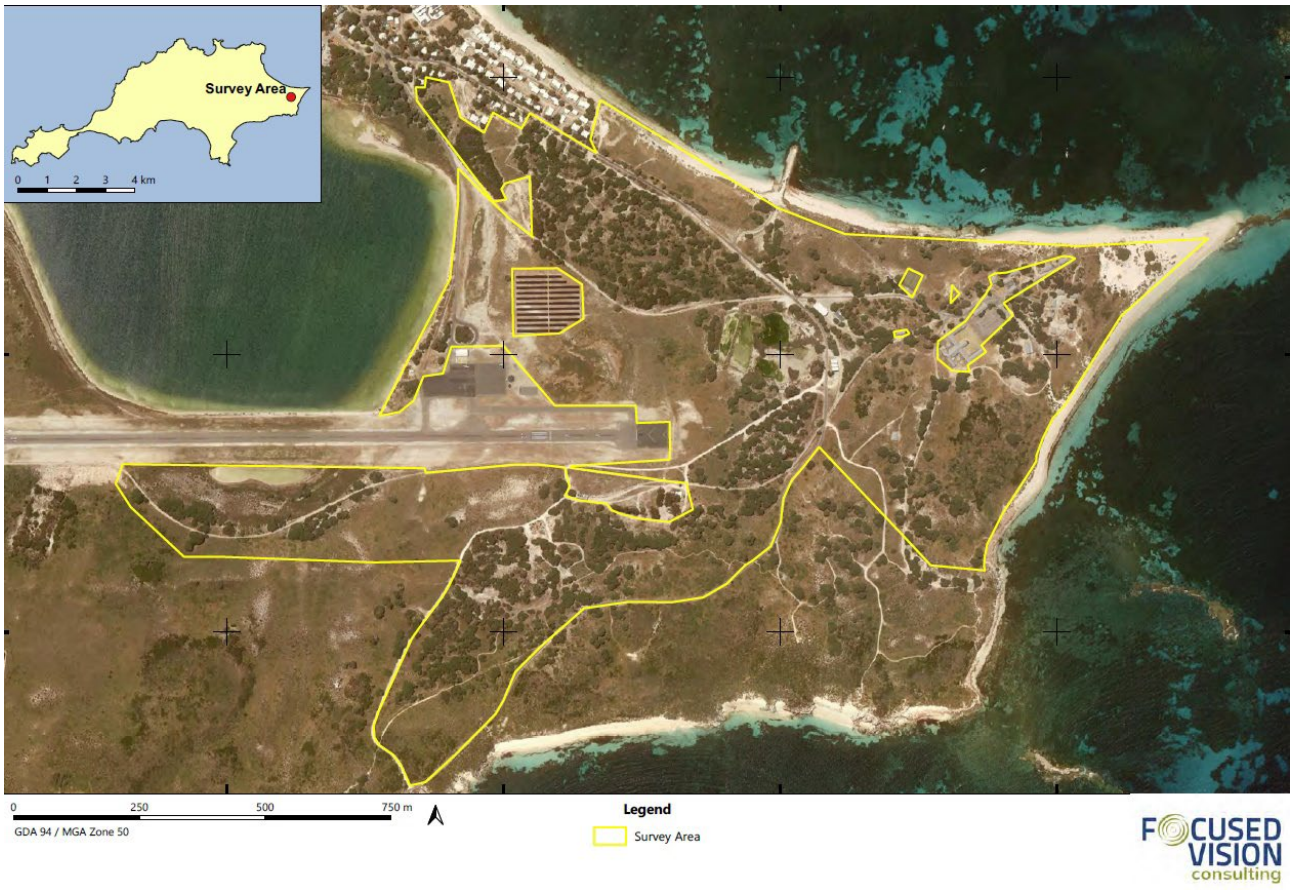


Figure 42: Terrestrial flora and vegetation surveys undertaken within vicinity of the proposal (Focused Vision Consulting survey area)

11.4 Receiving environment

11.4.1 Regional vegetation

Vegetation complexes within the terrestrial survey have defined by Heddle et al. (1980) as the Quindalup Complex. This complex is described as coastal dune consisting of two alliances: the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low, closed forest of *Melaleuca lanceolata* (Rottnest teatree) – *Callitris preissii* (Rottnest Island pine), the closed scrub of *Acacia rostellifera* (summer-scented wattle) and the low, closed *Agonis flexuosa* (peppermint) forest of Geographe Bay (FVC, 2023).

The pre-European extent and current known extent of this complex is summarised in Table 59. In the absence of specific data for Wadjemup / Rottnest, information relevant to the Swan Coastal Plain and the City of Cockburn, as the island falls within the district of the City of Cockburn.

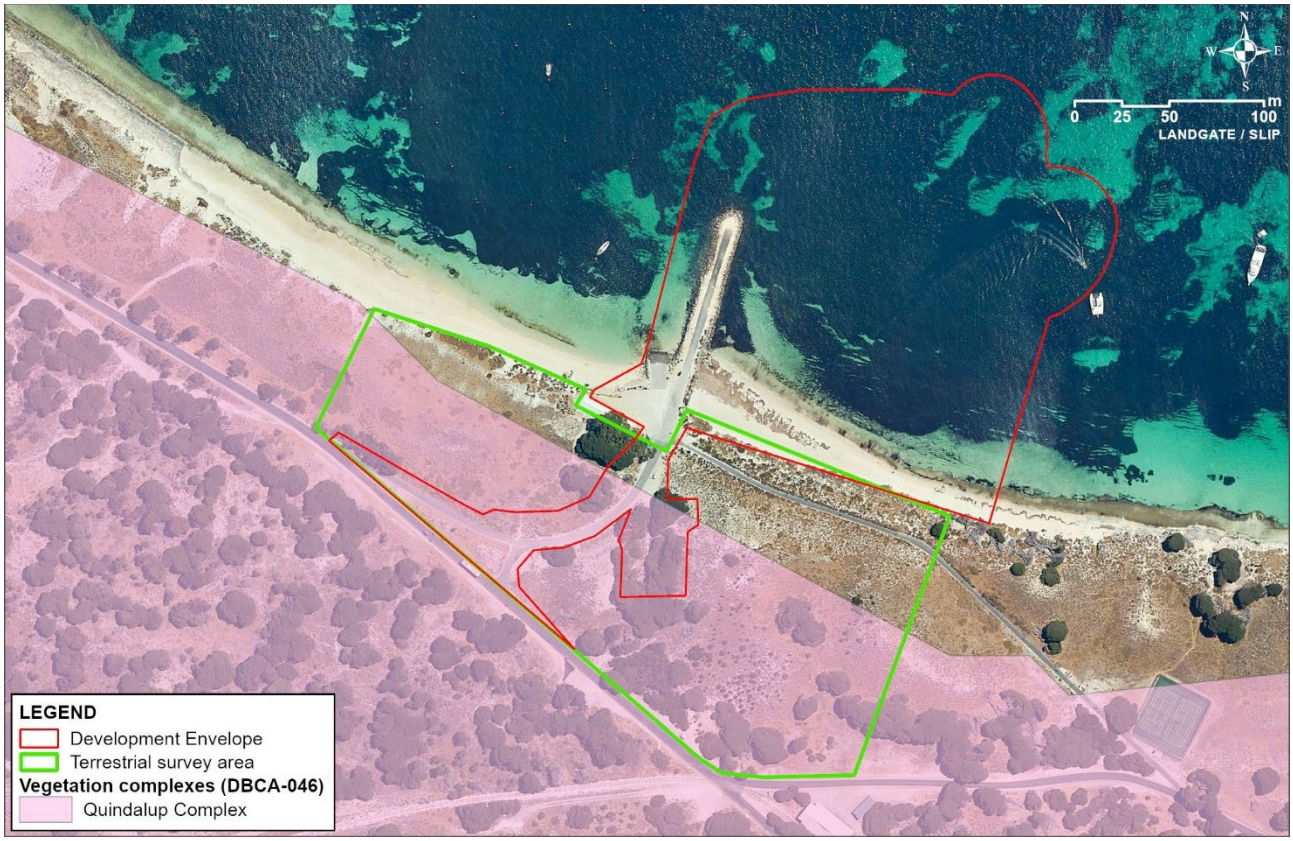


Figure 43: Vegetation complexes

Table 59: Extent of vegetation complexes within the terrestrial survey area

Regional extent	Vegetation complex	Pre-European extent	Current extent	Pre-European extent remaining
Swan Coastal Plain	Quindalup Complex	54,573.87 ha	33,011.64 ha	60.49%
City of Cockburn	Quindalup Complex	1,021.62 ha	728.23 ha	71.28%

(FVC, 2023)

The Commonwealth's National Targets and Objectives for Biodiversity Conservation (Environment Australia 2001) recognises that the retention of 30%, or more, of the preclearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. The EPA uses vegetation complexes as the basis for regional representation of biodiversity and has an objective to seek to retain at least 30% of the pre-clearing extent of each vegetation community (EPA 2015). Due to extensive clearing this target is not achievable for many of the vegetation complexes on the Swan Coastal Plain, making the remaining remnants regionally significant (EPA 2015).

The remaining extent for the Heddle et al. (1980) Quindalup complex exceeds 30% threshold for the Swan Coastal Plain IBRA region and City of Cockburn extents (Table 59).

11.4.2 Vegetation units

Three vegetation units were described over the terrestrial survey area. These vegetation units are shown in Figure 44 and described in Table 60.

Table 60: Vegetation units

Vegetation unit code	Description	Plate
ApAf*Td	*Acanthocarpus preissii, Scaevola crassifolia* low-mid shrubland/open shrubland over *Austrostipa flavescens* mid grassland/open grassland over **Trachyandra divaricata, Conostylis candicans* subsp. *calcicola* low forbland/open forbland.	
MlAp*Td	*Melaleuca lanceolata (Callitris preissii)* open woodland over *Acanthocarpus preissii, Rhagodia baccata* shrubland/low shrubland over **Trachyandra divaricata, Conostylis candicans* subsp. *calcicola* low very open forbland. NB Some of the *Melaleuca lanceolata* and *Callitris preissii* in this unit have been planted.	
Sc*TdSl	*Scaevola crassifolia* low open shrubland over **Trachyandra divaricata* low forbland over *Spinifex longifolius, Austrostipa flavescens* low-mid open grassland.	

Figure 44: Vegetation units

The areas of vegetation units present within the terrestrial survey area and development envelope are provided in Table 61.

Table 61: Areas of vegetation units within the development envelope

Vegetation unit code	Condition	Area of vegetation unit within survey area	Area of vegetation unit within development envelope
ApAf*Td	Good to Degraded	2.35 ha	0.17 ha
MlAp*Td	Degraded to Good	1.03 ha	0.23 ha
Sc*TdSl	Good to Degraded	0.38 ha	0.06 ha
cleared	Completely Degraded	0.40 ha	0.22 ha
Total area		**4.16 ha**	**0.68 ha**

11.4.3 Vegetation condition

Vegetation condition was assessed by the scale of Keighery (1996) as largely Good, mixed with patches of Degraded vegetation. In areas around taller shrubs and trees condition was assessed as Degraded with patches of Good condition (Figure 45).

The condition of the vegetation units described in Section 11.4.2 is provided in Table 61.

Figure 45: Vegetation condition

11.4.4 Flora species

Seventeen taxa were recorded in the survey area, 13 of these species were endemic taxa and the remaining four species were introduced. The endemic taxa belong to ten different families and thirteen different genera (Table 62).

Table 62 Endemic taxa in the survey area

Family	Taxon
Asparagaceae	*Acanthocarpus preissii*
Asteraceae	*Olearia axillaris*
Chenopodiaceae	*Rhagodia baccata*
Cupressaceae	*Callitris preissii*
Cyperaceae	*Ficinia nodosa*
Cyperaceae	*Gahnia trifida*
Goodeniaceae	*Scaevola crassifolia*
Haemodoraceae	*Conostylis candicans* subsp. *candicans*
Malvaceae	*Guichenotia ledifolia*
Myrtaceae	*Melaleuca lanceolata*
Poaceae	*Austrostipa flavescens*
Poaceae	*Spinifex longifolia*
Poaceae	*Sporobolus virginicus*

11.4.4.1 Weed species

Introduced flora species identified within the terrestrial survey area are listed in Table 63.

None of these introduced taxa are Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) or Weeds of National Significance (RPS, 2024d).

Table 63: Introduced taxa in the survey area

Family	Introduced taxon	Common name
Poaceae	*Avena barbata*	Bearded oat
Poaceae	*Bromus diandrus*	Great brome
Poaceae	*Lagurus ovatus*	Hare's tail grass
Asphodelaceae	*Trachyandra divaricata*	Onion weed

11.4.4.2 Conservation significant flora

All of the flora species identified within the terrestrial survey area are relatively common in similar habitats (RPS, 2024d).

No conservation significant taxa were recorded within the terrestrial survey area or development envelope.

11.4.5 Ecological communities

The vegetation unit MlAp*Td is analogous to the Threatened Ecological Community (TEC) *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain (floristic community type 30a as originally described by Gibson *et. al.* 1994). This TEC is listed as Critically Endangered under the state BC Act but is not listed under the EPBC Act.

1.03 ha of this vegetation unit was recorded within the survey area, of which 0.23 ha is located within the development envelope.

11.5 Potential environmental impacts

Table 64 provides the potential key impacts to terrestrial flora and vegetation from the proposal. These impacts are discussed in further detail in Sections 11.5.1.1 to 11.5.1.4.

Table 64: Potential impacts on terrestrial flora and vegetation

Phase	Impact class	Works / operations	Potential impacts
Construction	Direct	• Construction of the onshore project components.	**Removal of native vegetation** • Removal of 0.46 ha of native vegetation in Good to Degraded condition. • Of the native vegetation being cleared, 0.23 ha is analogous to the TEC; *Callitris preissii (or Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.
	Indirect	• Construction of the onshore project components.	**Introduction of invasive species (pests and weeds)** • Indirect loss or impact to flora and vegetation as a result of the introduction or spread of invasive species (pests and weeds) due to construction machinery and vehicles. **Introduction of disease** • Indirect loss or impact to flora and vegetation as a result of the introduction or spread of disease (for example, *Phytophthora* dieback) due to construction machinery and vehicles. **Accidental clearing** • During construction activities, there is a risk that native vegetation outside the areas directly impacted will be accidentally cleared.

Phase	Impact class	Works / operations	Potential impacts
			Localised erosion • During construction activities, there is for localised erosion to occur adjacent to cleared areas.
Operation	Indirect	• Vehicle / personnel movement	**Introduction of invasive species (pests and weeds)** • Indirect loss or impact to flora and vegetation as a result of the introduction or spread of invasive species (pests and weeds) due to vehicle and personnel movement during operation. **Introduction of disease** • Indirect loss or impact to flora and vegetation from the introduction or spread of disease due to vehicle and personnel movement during operation. **Degradation through incorrect waste disposal**

11.5.1 Assessment of impacts

11.5.1.1 Direct loss of native vegetation

Construction of the proposal will result in the removal of 0.46 ha of native vegetation. Conservation flora and vegetation values within this vegetation is summarised below:

- No conservation significant flora is present within the vegetation proposed to be cleared.
- Vegetation impacted comprises 0.23 ha of vegetation, which is analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.

The Commonwealth's National Targets and Objectives for Biodiversity Conservation (Environment Australia 2001) recognises that the retention of 30%, or more, of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. Section 11.4.1 identifies that the vegetation present within the development envelope is above the 30% threshold.

11.5.1.1.1 Assessment against the ten clearing principles

Clearing principles against which proposals to clear vegetation are assessed are listed under Schedule 5 of the EP Act. An assessment of the proposal against the ten clearing principles is provided in Table 65.

Table 65: Assessment against the clearing principles for native vegetation under Schedule 5 of the EP Act

Principle	Assessment	Variance
Principle (a) – native vegetation should not be cleared if it comprises a high level of biological diversity	Seventeen taxa were recorded in the survey area, thirteen of these species were endemic taxa and the remaining four species were introduced. All of the flora species identified within the terrestrial survey area are relatively common in similar habitats (RPS, 2024d). Therefore, vegetation within the site does not comprise a high level of biological diversity and is well represented elsewhere on the island. Biological diversity is considered likely to be reduced from the condition of the site. Vegetation assessments within the site identified the vegetation condition as Good to Degraded, mixed with patches of Degraded vegetation.	**Not at variance** Clearing of vegetation at this site is not at variance with this Principle.
Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significant habitat for, fauna indigenous to Western Australia	The fauna survey undertaken by EcoLogical (2024) recorded 14 native vertebrate fauna species within the site. One conservation significant fauna species was recorded within the site, the Quokka (*Setonix brachyurus*), listed as Vulnerable (VU) under the EPBC Act and BC Act. EcoLogical (2024) undertook a post survey likelihood of occurrence assessment and determined that of the conservation significant species identified from the desktop assessment, two are considered as having the potential to occur within the site; *Pandion haliaetus* (Osprey) and *Lerista lineata* (Perth slider). **Quokka** The Quokka was observed foraging under *Melaleuca lanceolata* and adjacent to *Acanthocarpus preissii* within the site. It is considered likely that the Quokka would use both habitat types within the site (Table 69). The Quokka is widespread across the island and the site does not comprise critical habitat for this species. **Osprey** The Osprey exhibits a preference for coastal cliffs and elevated islands but have also been known to occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging sites. The Osprey is considered as having the potential to occur within the survey area as a vagrant visitor, due to the availability of adjacent foraging habitat (saline water, beaches). However, the site is not necessary for the maintenance of significant habitat for this species. **Perth slider** This species occurs on sandy, coastal heath and shrubland and has the potential to occur within the site based on availability of suitable habitat. However, as sandy, coastal heath and shrubland is widespread across the island, the site is not necessary for the maintenance of significant habitat for this species.	**Not at variance** While these conservation significant species may occur within the site, the site is not considered likely to comprise habitat critical to the species survival. As such, clearing 0.46 ha of vegetation is unlikely to have a significant impact on these species.
Principle (c) Native vegetation should not be cleared if it includes or is necessary for the continued existence of rare flora	No conservation significant taxa were recorded within the terrestrial survey area or development envelope.	**Not at variance** The proposal is not at variance with this Principle.
Principle (d) – Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a Threatened Ecological Community (TEC)	The vegetation unit MIAp*Td is analogous to the TEC *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain (floristic community type 30a as originally described by Gibson et. al. 1994). This TEC is listed as Critically Endangered under the state BC Act but is not listed under the EPBC Act. 1.03 ha of this TEC was recorded within the survey area, of which 0.23 ha is located within the development envelope. Focused Vision Consulting also identified this TEC in the area surrounding the development envelope, considering vegetation units MIAp and CpMI to be representative of the TEC (Appendix I). Focused Vision Consulting identified 44.39 ha of MIAp and 0.6 ha of CpMI within vicinity of the development envelope. As the proposed clearing of 0.23 ha of the TEC will result in a loss of 0.52% of the TEC identified in the Focused Vision survey area, impacts to vegetation analogous with this TEC are not considered significant. It should also be noted that this vegetation type is likely to be more widespread across the island that the survey area.	**May be at variance** The proposal will result in the clearing of 0.23 ha of vegetation that is analogous with the TEC. However, as this only comprises 0.52% of the TEC identified in the area, the vegetation within the site is unlikely to be necessary for the maintenance of the TEC. Especially as the vegetation within the site is in a Good to Degraded condition.
Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	The Commonwealth's National Targets and Objectives for Biodiversity Conservation (Environment Australia 2001) recognises that the retention of 30%, or more, of the preclearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. The EPA uses vegetation complexes as the basis for regional representation of biodiversity and has an objective to seek to retain at least 30% of the pre-clearing extent of each vegetation community (EPA 2015). Due to extensive clearing this target is not achievable for many of the vegetation complexes on the Swan Coastal Plain, making the remaining remnants regionally significant (EPA 2015). Section 11.4.1 identifies that the vegetation present within the development envelope is above the 30% threshold.	**Not at variance** The remaining extent for the Heddle et al. (1980) Quindalup complex exceeds 30% threshold for the Swan Coastal Plain IBRA region and City of Cockburn extents.
Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	There are no wetlands or watercourses within or adjacent to the site. As such, the 0.46 ha of vegetation proposed to be cleared is not growing in association with a watercourse or wetland.	**Not at variance** The 0.46 ha of vegetation proposed to be cleared is not growing in association with a watercourse or wetland.
Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	The substrate of the site is unconsolidated sand formed into a dune. Sandy soils are prone to wind erosion, however as the site is proposed to be developed and will be managed as outlined in the CEMP, it will not contribute to land degradation on or adjacent to the site.	**Not at variance** The potential for erosion will be managed as outlined in the CEMP.
Principle (h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation areas	There are no significant environmental or conservation values adjacent to the site which will be impacted by the proposed clearing. Implementation of the CEMP will minimise potential impacts to surrounding vegetation.	**Not at variance** The proposal is not at variance with this Principle.
Principle (i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	The small area of the proposed clearing would not be expected to contribute towards or cause deterioration in the quality of underground or surface water. Implementation of the CEMP and OEMP will minimise the risk of impacts to surface and groundwater quality.	**Not at variance** The proposal is not at variance with this Principle.
Principle (j) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence of flooding	Wadjemup / Rottnest Island receives a mean rainfall of 564.6 mm per annum, with the local climate consisting of cool wet winters and warm dry summers. Maximum mean rainfall occurs in July, with 111.5 mm. Flooding is not an issue as the soil is sandy and porous, and given the small area subject to this proposal this is not likely to change.	**Not at variance** The proposal is not at variance with this Principle.

11.5.1.2 Accidental clearing

During construction activities, there is a risk that native vegetation outside the areas directly impacted will be accidentally cleared. The implementation of the CEMP will reduce the risk of this occurring.

11.5.1.3 Localised erosion

There is a risk for localised erosion to occur adjacent to cleared areas or due to surface water run-off. Localised erosion may impact vegetation adjacent to the development envelope.

11.5.1.4 Introduction and spread of weeds

Four introduced flora species were identified within the terrestrial survey area. None of these species were listed as Declared Pests under the BAM Act or Weeds of National Significance. The presence of weeds adjacent to the development envelope has the potential to increase as a result of construction activities.

The implementation of the weed hygiene management measures outlined in the CEMP is expected to reduce the risk of spread as a result of the proposal. The proposal is not expected to result in the spread of weeds that could result in significant vegetation and flora impacts.

11.5.1.5 Introduction and spread of disease

There is potential for the movement of construction machinery to result in the introduction of disease (e.g. *Phytophthora* dieback). The implementation of the hygiene management measures outlined in the CEMP is expected to reduce the risk of disease introduction or spread as a result of the proposal.

11.5.1.6 Degradation through incorrect waste disposal

An increase in litter due to incorrect waste disposal has the potential to impact the surrounding vegetation.

11.6 Mitigation

Table 66 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of terrestrial flora and vegetation to address the key potential impacts.

Table 66: Application of mitigation hierarchy to terrestrial flora and vegetation

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Removal of native vegetation	Direct	Avoid	Avoidance of impacts to the 0.8 ha of the TEC (MIAp*Td) surveyed outside the development envelope.	**Removal of 0.46 ha of native vegetation in Good to Degraded condition** Of the native vegetation being cleared, 0.23 ha comprises the state listed TEC; *Callitris preissii (or Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.
		Minimise	• A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to native vegetation is limited to the 0.46 ha within the development envelope. Management measures to limit impacts outside the development envelope include: – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid accidental clearing or disturbance of surrounding vegetation – All identified populations of MIAp*Td will be delineated using highly visible flagging or similar around all identified populations to avoid impacts to the 0.8 ha of MIAp*Td surveyed outside the development envelope – Establishment of clearly delineated access points to prevent unauthorised disturbance and access – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area – Daily inspections to visually check / review clearing boundaries and compliance during clearing activities – Photographic records of the clearing area pre- and post-clearing activities – Inspection to verify no degradation or disturbance beyond approved clearing boundary from erosion. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of weed species to the site as a result of operation.	
		Rehabilitate	There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal.	
		Offset	Terrestrial flora and vegetation offsets are not proposed for terrestrial flora and vegetation as only 0.52% of the TEC identified in the surrounding area will be directly impacted.	
Introduction and spread of weeds	Indirect	Avoid	There is no opportunity to avoid the movement of construction vehicles within the area, as such the risk for the spread and introduction of weed species cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP and OEMP, residual impacts to terrestrial flora and vegetation resulting from the spread and introduction of weeds during construction are not considered significant.
		Minimise	• Construction management and monitoring measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Implementation of the weed management protocol as outlined in the CEMP – Weekly inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species, including: ○ Weekly spot checks of mobile equipment and vehicles ○ hygiene points at key road entry points ○ Implementation of the weed management protocol outlined in the CEMP – Stockpile management, including stockpile locations (within the development envelope), erosion and stabilisation techniques and height limits – Designated areas for the temporary placement of cleared vegetation (within the development envelope) to minimise the increased risk of weed and disease spread and bushfire – The contractor will supply weed and weed certificates prior to mobilising vehicles and machinery. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of weed species to the site as a result of operation. • Key management measures outlined in the OEMP (Emerge, 2025b) (Appendix Q) to avoid indirect impacts to native vegetation (inclusive of the TEC) adjacent to the proposal includes: – Vehicle access will be clearly marked and restricted to designated roads and paths. If observations / incidents of vehicle related impacts on flora and vegetation are reported, then further contingency actions will be implemented. These include additional staff education and installation of barrier fencing and bollards – Waste disposal measures such as provision of suitable bins and clean up of any windblown rubbish will be implemented to prevent an increase in litter impact on surrounding vegetation.	
		Rehabilitate	Should the proposal result in the introduction of weed species, appropriate management and control measures will be implemented.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	
Introduction and spread of disease	Indirect	Avoid	There is no opportunity to avoid the movement of construction vehicles within the area, as such the risk for the spread and introduction of disease cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP and OEMP, residual impacts to terrestrial flora and vegetation resulting from the spread and introduction of disease during construction are not considered significant.
		Minimise	• Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Appropriate hygiene measures to minimise the risk of the spread and introduction of disease – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid the risk of disease spread. • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope. • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of disease to the site as a result of operation.	
		Rehabilitate	Should the proposal result in the introduction of disease, appropriate management measures will be implemented.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Accidental clearing	Indirect	Avoid	The risk for accidental vegetation clearing cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP, residual impacts to terrestrial flora and vegetation resulting from accidental clearing are not considered significant.
		Minimise	• Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area. • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope.	
		Rehabilitate	There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal. Any accidental clearing will be rehabilitated.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	
Localised erosion	Indirect	Avoid	The risk for erosion cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP, residual impacts to terrestrial flora and vegetation resulting from accidental clearing are not considered significant.
		Minimise	• Construction management measures to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works will minimise localised erosion – Establishment of clearly delineated access points to prevent unauthorised disturbance and access. • Monitoring during construction to minimise impacts to terrestrial flora and vegetation is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope.	
		Rehabilitate	Any areas of erosion outside the development envelope which impacts vegetation condition will be rehabilitated.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	
Degradation through incorrect waste disposal.	Indirect	Avoid	Complete avoidance for the risk of litter is unavoidable.	**No residual impacts expected** With the implementation of the CEMP and OEMP, residual impacts to terrestrial flora and vegetation resulting from degradation from waste and litter are not considered significant.
		Minimise	• A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to native vegetation is limited to the 0.46 ha within the development envelope. Measures to manage waste disposal will be implemented as per the CEMP to minimise the risk for degradation of the surrounding vegetation • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that waste disposal measures are implemented to prevent rubbish and litter degrading surrounding vegetation.	
		Rehabilitate	As outlined in the OEMP, litter cleanup will be undertaken if required to prevent an increase in litter impact on surrounding vegetation.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	

11.7 Assessment and significance of residual impact

The residual impacts to flora and vegetation after the application of the mitigation hierarchy outlined in Table 66 are summarised below:

- Removal of 0.46 ha of native vegetation in Good to Degraded condition. Of the native vegetation being cleared, 0.23 ha is analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.

The predicted residual impacts to flora and vegetation from the proposal are not considered significant as discussed in Table 67.

Table 67: Consideration of the significance of the residual impacts on terrestrial flora and vegetation

Matters for consideration	Response
The object and principles of the EP Act	A reconnaissance survey was undertaken by RPS within the terrestrial survey area shown in Figure 41 (Appendix J) in accordance with Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b). The principles of the EP Act have been specifically addressed in relation to the proposal (Table 26).
Values, sensitivity and quality of the environment which is likely to be impacted	All of the flora species identified within the terrestrial survey area are relatively common in similar habitats (RPS, 2024d) and no conservation significant flora species were identified within the development envelope. Therefore, impacts to flora from implementation of the proposal are not considered significant. 0.23 ha of the vegetation within the development envelope is analogous with the TEC, *Callitris preissii (*or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain. This TEC is listed as Critically Endangered under the BC Act. Focused Vision Consulting identified this TEC in the area surrounding the development envelope, considering vegetation units MIAp and CpMI to be representative of the TEC (Appendix I). Focused Vision Consulting identified 44.39 ha of MIAp and 0.6 ha of CpMI within vicinity of the development envelope. As the proposed clearing of 0.23 ha of the TEC will result in a loss of 0.52% of the TEC identified in the area, impacts to vegetation from implementation of the proposal are not considered significant.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	Construction of the proposal will result in the removal of 0.46 ha of native vegetation in Good to Degraded condition. Of the native vegetation being cleared, 0.23 ha comprises the TEC; *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.
Resilience of the environment	All of the flora species identified within the terrestrial survey area are relatively common in similar habitats (RPS, 2024d). The vegetation within the development envelope ranges from Degraded (32.2% of vegetation in the development envelope) to Good to Degraded (67.8% of vegetation in the development envelope). As there is vegetation in better condition outside the development envelope and flora species present are relatively common on the island, the environment is considered resilient to the clearing proposed as part of this Proposal.
Consequence of the application of the mitigation hierarchy to the proposal.	The WA Offsets Guidelines (Government of Western Australia 2014) identifies four levels of significance for residual impacts: • Unacceptable impacts – those impacts which are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset. • Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level.

Matters for consideration	Response
	• Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement • Impacts which are not significant – impacts which do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset. Following the application of the mitigation hierarchy outlined in Table 66 and taking into consideration the above significance of residual impacts model, RPS considers that there are no significant residual impacts to terrestrial flora and vegetation from the proposal.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment has been completed with a high level of confidence in the predictions of residual impacts on terrestrial flora and vegetation, with the required scientific assessments conducted as discussed in Section 11.3. The EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) states that 'a reconnaissance survey is required where flora and vegetation values are well defined, the area is not likely to support significant flora or vegetation and the scale and nature of the potential impacts are not likely to be significant'. RPS considered these criteria to be met and that the small size of the site precluded the implementation of a detailed survey using quadrats.
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

11.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to terrestrial flora and vegetation are:

- Direct impacts to native vegetation resulting from the proposal will be confined to the development envelope.
- Direct impacts to native vegetation (MlAp*Td) analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain will be confined to the development envelope and will not exceed 0.23 ha.
- No reduction in the extent or modification of the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain outside the development envelope as a result of the proposal.
- No introduction of new weed species attributable to the proposal.

Adaptive management measures will be implemented in accordance with the CEMP to ensure this environmental outcome is met. As the impact assessment identified low residual risks to terrestrial flora and vegetation following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet this the EPA's objective to protect terrestrial flora and vegetation.

12 TERRESTRIAL FAUNA

12.1 EPA objective

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

12.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process.

Table 68 lists relevant EPA guidance, other state and Commonwealth legislation / policy, and provides consideration for how these documents informed the proposal.

Table 68: Relevant legislation, policy and guidance

Legislation, policy and guidance	Consideration
Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016d)	The environmental factor guideline identifies the environmental values of terrestrial fauna. These considerations were underpinned as part of the impact assessment on terrestrial fauna summarised in Section 12.5 of this report.
Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)	This technical guidance guides the appropriate obtainment and collation of terrestrial fauna data to be used for environmental impact assessments. The Rottnest Island Basic Fauna Survey (EcoLogical 2024) (Appendix K) was undertaken with regard for this guidance document.
Environment Protection and Biodiversity Conservation Act 1999	A search of DCCEEW's PMST was undertaken within a 5 km radius of the proposal to determine the MNES that are either known or likely to occur proximate to the proposal (Appendix R). A discussion of potential impacts on MNES is discussed in Section 14.2.
Biodiversity Conservation Act 2016	A search of the DBCA's NatureMap database was undertaken to determine a list of conservation significant terrestrial fauna species that have been recorded within 10 km of the proposal (Appendix R).

12.3 Environmental investigations

EcoLogical (2024) undertook a basic terrestrial fauna survey within the terrestrial survey area (Figure 46) in accordance with EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA, 2020). The Basic terrestrial fauna survey report is provided in Appendix K and included:

- A desktop assessment
- A site survey undertaken on 31 October 2023 to delineate and map fauna habitats and record opportunistic sightings of fauna.

Figure 46: Terrestrial fauna survey area and survey effort

12.4 Receiving environment

12.4.1 Fauna habitat

Two fauna habitat types were recorded within the survey area, as described in Table 69.

Table 69: Fauna habitat

Fauna habitat description	Conservation significant fauna species potentially utilising the habitat	Area surveyed	Plate
Habitat type 1: Trees and tall shrubs over low shrubs, grasses and herbs on sand dunes.	• *Lerista lineata* (Perth slider) • *Pandion haliaetus* (osprey) • *Pseudonaja affinis exilis* (Rottnest Island dugite) • *Tiliqua rugosa konowi* (Rottnest Island bobtail) • *Setonix brachyurus* (quokka).	0.87 ha	
Habitat type 2: Low shrubs over grasses and herbs on sand dunes.	• *Lerista lineata* (Perth slider) • *Pandion haliaetus* (osprey) • *Pseudonaja affinis exilis* (Rottnest Island dugite) • *Tiliqua rugosa konowi* (Rottnest Island bobtail) • *Setonix brachyurus* (quokka).	3.00 ha	

(Eco Logical Australia, 2024)

12.4.2 Fauna species

A total of 14 native vertebrate fauna species were recorded within the survey area during the field survey undertaken by EcoLogical (2024). No introduced (feral) fauna species were recorded within the survey area.

12.4.2.1 Conservation significant fauna species

A likelihood of occurrence assessment was undertaken by EcoLogical (2024) as part of the fauna assessment. Those species that have been recorded within the survey area or were identified as having the potential to occur within the survey area based on species distributions and habitat present are summarised in Table 70.

Species considered unlikely to occur within the development envelope are not discussed in Table 70, however are discussed in the Basic fauna survey report provided in Appendix K.

Refer to Section 10 for marine fauna species.

Table 70: Conservation significant fauna species with the potential to occur within the development envelope

Species	Common name	Conservation status		Habitat description	Likelihood assessment
		EPBC Act	BC Act / DBCA		
Setonix brachyurus	Quokka	Vulnerable	Vulnerable	The quokka is a habitat specialist. In the north of its range it prefers dense understorey, less than ten years since fire, adjacent vegetation age that is greater than 25 years and the absence of feral predators. The understorey structure of the habitats currently inhabited by the quokka consist of dense, low vegetation that provides refuge from predation by owls, the fox (*Vulpes vulpes*) and the cat (*Felis catus*). These covered/shady microhabitats may also be important during the hotter months, particularly on Wadjemup / Rottnest Island, where animals converge in dense thickets of *Gahnia* spp. and *Acanthocarpus* spp. The main habitat for mainland populations of the quokka is dense riparian vegetation, but the species also uses a range of other habitat, including heath and shrubland on the mainland coast and offshore islands, swampy shrublands, swordgrass dominated understorey, paperbark (*Melaleuca* spp.) swamp.	**Recorded** Suitable habitat is present within development envelope.
Pandion haliaetus	Osprey	Migratory	Migratory	Eastern ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging.	**Potential** Marginal habitat for this species is present within the development envelope (coastal areas, trees for perching, adjacent ocean for foraging). Species is highly mobile and may utilise the development envelope as a transient visitor.
Tiliqua rugosa konowi	Rottnest Island bobtail	-	Vulnerable	Rottnest Island bobtails are common around limestone rocks and prefer limestone heath, woodland, and coastal habitats, but also be found around the Settlement Area.	**Recorded** Previously recorded by RIA (RIA; pers comms 5 January 2024)
Lerista lineata	Perth slider, lined skink	-	P3	The species was found in summer-scented wattle (*Acacia rostellifera*) scrub on Wadjemup / Rottnest Island in 2016. Occurs in white sand.	**Potential** Suitable habitat is present within development envelope.
Pseudonaja affinis exilis	Rottnest Island dugite	-	P4	Dugites live in abandoned burrows or hollow logs and prefer coastal habitat, limestone heath, woodland, and the Settlement areas of the island.	**Recorded** Previously recorded by RIA (RIA; pers comms 5 January 2024)

(EcoLogical Australia, 2024)

12.5 Potential environmental impacts

Table 71 provides the potential key impacts to terrestrial fauna from the proposal. These impacts are discussed in further detail in Sections 12.5.1 to 12.5.4.

Table 71: Potential impacts on terrestrial fauna

Phase	Impact class	Works / operations	Potential impacts
Construction	Direct	• Construction of the onshore project components	**Loss of terrestrial fauna habitat** • Removal of 0.46 ha of potential terrestrial fauna habitat. **Injury and / or mortality of terrestrial fauna** • Risk of injury of terrestrial fauna during vegetation clearing and ground disturbing activities.
		• Construction machinery and vehicles.	**Injury and / or mortality of terrestrial fauna** • Risk of collision risk with construction vehicles leading to injury/mortality of terrestrial fauna.
	Indirect	• Construction of the onshore project components.	**Alteration of fauna behaviour** • Altered fauna behaviour due to noise, lighting and increased human presence during construction of the proposal. **Indirect loss or impact to terrestrial fauna habitat from habitat degradation** • Indirect loss or impact to terrestrial fauna habitat from habitat degradation as a result of: – The introduction or spread of invasive species (pests and weeds) due to construction machinery and vehicles – The introduction or spread of disease (for example, dieback) due to construction machinery and vehicles. – Inappropriate disposal of waste. **Loss of terrestrial fauna habitat** • During construction activities, there is a risk that terrestrial fauna habitat outside the areas directly impacted will be accidentally cleared. **Localised erosion** • During construction activities, there is potential for localised erosion to occur adjacent to cleared areas.
Operation	Indirect	• Operation	**Indirect loss or impact to terrestrial fauna habitat from habitat degradation** • Indirect loss or impact to terrestrial fauna habitat from habitat degradation as a result of: – The introduction or spread of invasive species (pests and weeds) due to construction machinery and vehicles – The introduction or spread of disease (for example, *Phytophthora* dieback) due to construction machinery and vehicles. – Inappropriate disposal of waste. **Injury and / or mortality of terrestrial fauna** • Risk of collision risk with construction vehicles leading to injury/mortality of terrestrial fauna.

12.5.1 Assessment of impacts

12.5.1.1 Direct loss of terrestrial fauna habitat

Construction of the proposal will result in the removal of 0.46 ha of potential terrestrial fauna habitat. Conservation significant species which may occur within this habitat includes:

- *Lerista lineata* (Perth slider)

- *Pandion haliaetus* (osprey)
- *Pseudonaja affinis exilis* (Rottnest Island dugite)
- *Tiliqua rugosa konowi* (Rottnest Island bobtail)
- *Setonix brachyurus* (quokka).

12.5.1.2 Habitat degradation

Four introduced flora species were identified within the terrestrial survey area. None of these species were listed as Declared Pests under the BAM Act or Weeds of National Significance. The presence of weeds adjacent to the development envelope has the potential to increase as a result of construction activities. The presence of weeds has the potential to impact and degrade the terrestrial fauna habitat present.

The implementation of the weed hygiene management measures outlined in the CEMP is expected to reduce the risk of spread as a result of the proposal. The proposal is not expected to result in the spread of weeds that could have a significant vegetation and flora impacts.

There is potential for the movement of construction machinery to result in the introduction of disease (e.g. *Phytophthora* dieback). The implementation of the hygiene management measures outlined in the CEMP is expected to reduce the risk of disease introduction or spread as a result of the proposal.

An increase in litter due to incorrect waste disposal has the potential to impact the surrounding vegetation.

12.5.1.3 Injury and mortality of fauna species

Construction of the proposal may result in increased vehicle movements within the development envelope, which would increase the risk associated with vehicle strike. There is also potential for injury or mortality of displaced fauna during vegetation clearing activities. Construction activities will be undertaken in accordance with measures identified in the CEMP to ensure that the risk of these impacts is minimised.

It is unlikely operation of the proposal will significantly increase the potential for fauna strike, given the existing presence of roads within the area.

12.5.1.4 Altered fauna behaviour

During construction, there will be noise and vibration emissions due to vehicles movements and construction activities. Noise and vibration associated with construction of the proposal have the potential to result in short-term disturbance to fauna on a local scale. It is unlikely operation of the proposal will significantly alter fauna behaviour.

12.6 Mitigation

Table 72 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of terrestrial fauna to address the key potential impacts.

Table 72: Application of mitigation hierarchy to terrestrial fauna

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Removal of potential terrestrial fauna habitat	Direct	Avoid	Complete avoidance of direct impacts to fauna habitat is not possible.	**Removal of 0.46 ha of potential fauna habitat**
		Minimise	A CEMP (Emerge, 2025a) (Appendix P) will be implemented to ensure impacts to terrestrial fauna habitat is limited to the 0.46 ha within the development envelope. Management measures to minimise potential impacts outside the development envelope are discussed in this table.	
		Rehabilitate	There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal.	
		Offset	Terrestrial fauna offsets are not considered applicable to the proposal.	
Habitat degradation from the introduction and spread of weeds and disease and incorrect waste disposal.	Indirect	Avoid	There is no opportunity to avoid the movement of construction vehicles within the area, as such the risk for the spread and introduction of weed species cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP and OEMP, residual impacts to terrestrial fauna habitat resulting from the spread and introduction of weeds during construction are not considered significant.
		Minimise	• Construction management and monitoring measures to minimise impacts to terrestrial fauna habitat are detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species – Extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works. Movement of construction vehicles within vegetation outside this area will be limited to avoid the risk of weed spread – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope – Appropriate hygiene measures to minimise the risk of the spread and introduction of weed species: ○ Weekly spot checks of mobile equipment and vehicles ○ hygiene points at key road entry points ○ Implementation of the weed management protocol outlined in the CEMP – Stockpile management, including stockpile locations (within the development envelope), erosion and stabilisation techniques and height limits – Designated areas for the temporary placement of cleared vegetation (within the development envelope) to minimise the increased risk of weed and disease spread and bushfire • Operational management to minimise impacts to flora and vegetation is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Vehicle access is controlled to designated roads and access – There is no introduction of weed species to the site as a result of operation.	
		Rehabilitate	Should the proposal result in the introduction of weed species, appropriate management and control measures will be implemented.	
		Offset	Terrestrial flora and vegetation offsets are not considered applicable to the proposal.	
Accidental clearing of potential fauna habitat	Indirect	Avoid	The risk for accidental vegetation clearing cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP, residual impacts to terrestrial fauna habitat resulting from accidental clearing are not considered significant.
		Minimise	• Construction management measures to minimise impacts to terrestrial fauna habitat is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Installation of temporary fencing, inclusive of sediment controls, along the boundary of the terrestrial construction works area to restrict machinery access to be within the approved disturbance area • Monitoring during construction to minimise impacts to terrestrial fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Daily inspections and photographic records during clearing and construction activities – Inspections to verify no degradation or disturbance has occurred beyond the development envelope.	
		Rehabilitate	There is no opportunity to rehabilitate the areas directly impacted by construction of the proposal. Any accidental clearing outside the approved area will be rehabilitated.	
		Offset	Terrestrial fauna offsets are not considered applicable to the proposal.	
Injury and mortality of fauna species	Direct	Avoid	The risk for injury and / or mortality of fauna cannot be completely avoided.	**No residual impacts expected** With the implementation of the CEMP and OEMP, residual impacts to the injury or mortality of terrestrial fauna are not considered significant.
		Minimise	• Construction management measures to minimise impacts to terrestrial fauna is detailed in the CEMP (Emerge, 2025a) (Appendix P) and includes: – Vehicles, plant, and equipment to be restricted within development envelope – The extent of authorised disturbance will be clearly defined and demarcated on appropriate plans. The demarcated terrestrial construction works area to be surveyed prior to the commencement of vegetation removal works – Vegetation clearing will be undertaken progressively and towards retained vegetation – Vehicle speed limits will be implemented in accordance with the CEMP – If native fauna is encountered during clearing works it should, initially, be allowed to make its own way from the works area. However, if this is not possible or practicable, a qualified wildlife handler will be contacted to relocate it • It is unlikely operation of the proposal will significantly increase the potential for fauna strike, given the existing presence of roads within the area. The OEMP (Appendix Q) outlines measures to minimise the risk of injury to terrestrial fauna during operation.	
		Rehabilitate	Injured animals will be provided with first aid and handled on advice from the Wildcare Helpline and Rottnest Island Authority rangers.	
		Offset	Terrestrial fauna offsets are not considered applicable to the proposal.	

12.7 Assessment and significance of residual impact

The anticipated significance of the residual impacts of the proposal on terrestrial fauna following the implementation of mitigation measures are low as detailed in Table 73. The residual impacts are summarised below:

- Removal of 0.46 ha of potential terrestrial fauna habitat in Good to Degraded condition.

Table 73: Consideration of the significance of the residual impacts on terrestrial fauna

Matters for consideration	Response
The object and principles of the EP Act	EcoLogical (2024) undertook a basic terrestrial fauna survey within the terrestrial survey area (Figure 34) in accordance with EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA, 2020). The Basic terrestrial fauna survey report is provided in Appendix K. The principles of the EP Act have been specifically addressed in relation to the proposal (Table 26).
Values, sensitivity and quality of the environment which is likely to be impacted	Conservation significant fauna species which were identified within the site or are likely to utilise the habitat present include: • *Lerista lineata* (Perth slider) • *Pandion haliaetus* (osprey) • *Pseudonaja affinis exilis* (Rottnest Island dugite) • *Tiliqua rugosa konowi* (Rottnest Island bobtail) • *Setonix brachyurus* (quokka). Focused Vision Consulting undertook flora and vegetation surveys within the area shown in Figure 42. The vegetation surveyed by Focused Vision Consulting that was most analogous to the vegetation present within the development envelope comprised the vegetation units MIAp and MIGl with a combined area of 67.39 ha. As such, it has been assumed that there is approximately 67.39 ha of similar fauna habitat to the 0.46 ha being directly impacted within vicinity of the proposal. It is also considered likely that the vegetation and associated fauna habitat is not restricted locally to the FVC and RPS survey areas and is more widespread on the island. The direct impacts to 0.46 ha of potential fauna habitat comprises 0.68% of the larger area surveyed by Focused Vision Consulting. Wadjemup / Rottnest Island encompasses approximately 1,800 ha, most of which is vegetated. If a conservative estimate is adopted, with an assumption that half of the island remains vegetated, clearing 0.46 ha of vegetation comprising potential fauna habitat would comprise 0.05% of the vegetation present on the island. Direct impacts to habitat suitable for these species are limited to 0.46 ha and is not considered significant when considering the terrestrial fauna habitat present outside the development envelope.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	Construction of the proposal will result in the removal of 0.46 ha of potential fauna habitat in Good to Degraded condition. Implementation of the CEMP will ensure that indirect impacts to terrestrial fauna species will be minimal and localised to the development envelope.
Resilience of the environment	The vegetation comprising potential habitat for terrestrial fauna species within the development envelope ranges from Degraded (32.2% of vegetation in the development envelope) to Good to Degraded (67.8% of vegetation in the development envelope). As there is vegetation in better condition outside the development envelope, the environment is considered resilient to the clearing proposed as part of this proposal.

Matters for consideration	Response
Consequence of the application of the mitigation hierarchy to the proposal.	The WA Offsets Guidelines (Government of Western Australia 2014) identifies four levels of significance for residual impacts: • Unacceptable impacts – those impacts which are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset. • Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level. • Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement • Impacts which are not significant – impacts which do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset. Following the application of the mitigation hierarchy outlined in Table 72 and taking into consideration the above significance of residual impacts model, RPS considers that there are no significant residual impacts to terrestrial fauna from the proposal.
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	The impact assessment has been completed with a high level of confidence in the predictions of residual impacts on terrestrial fauna, with the required scientific assessments conducted in accordance with relevant guidance and legislation (Table 68).
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

12.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to terrestrial fauna are:

- No project related disturbance of conservation significant terrestrial fauna or conservation significant fauna habitat outside of the development envelope.
- No introduction of new weed species attributable to the proposal.
- No increase in incidents of terrestrial fauna injury or death during construction associated with the proposal.

Adaptive management measures will be implemented in accordance with the CEMP to ensure this environmental outcome is met. As the impact assessment identified low residual risks to terrestrial fauna following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet this the EPA's objective to protect terrestrial fauna.

13 SOCIAL SURROUNDINGS

13.1 EPA objective

To protect social surroundings from significant harm.

13.2 Policy and guidance

The proposal will be subject to compliance with applicable policies and guidance developed to assist proponents and the public to understand the minimum requirements for the protection of elements of the environment that the EPA expects to be met during the assessment process.

Table 74 lists relevant EPA guidance, other state and Commonwealth legislation / policy, and provides consideration for how these documents informed the proposal.

Table 74: Relevant legislation, policy and guidance

Legislation, policy and guidance	Consideration
Aboriginal Heritage Act 1972	The *Aboriginal Cultural Heritage Act 2021* superseded the *Aboriginal Heritage Act 1972* on 1 July 2023 but was repealed and the 1972 Act reinstated on 15 November 2023. The *Aboriginal Heritage Act 1972* is the legislation that manages Aboriginal cultural heritage (ACH) in Western Australia. Approval is required where there is potential for any harm to an Aboriginal site. Approval may be required from either the Minister for Aboriginal Affairs or the Registrar of Aboriginal Sites for any activity which may harm ACH. There are four types of authorisations: • Section 18 consent – for more significant impacts and harm to Aboriginal sites • Section 16 authorisation – for excavation purposes (generally related to research) • Regulation 7 approval – to bring plant and equipment to an Aboriginal site • Regulation 10 consent – for more minor activities and impacts. Brad Goode and Associates Pty Ltd conducted a Site Identification Ethnographic Aboriginal Heritage Survey to determine potential impacts to any sites or places of Aboriginal heritage significance as defined by section 5 of the *Aboriginal Heritage Act 1972* (Brad Goode and Associates, 2019).
Environmental Factor Guideline – Social Surroundings (EPA, 2023)	The purpose of this guideline is to identify how the factor social surroundings is considered by the EPA in the environmental impact. The proposal considers the mitigation hierarchy; direct and indirect impacts; implications of cumulative impacts; predicted residual impacts associated within social surroundings. Section 13.4 provides a detailed review of social surrounding aspects likely to be impacted by the proposal, including Aboriginal heritage, natural and historical heritage (including shipwrecks), and recreational values. The environmental factor guideline identifies the key social surrounding aspects and their significance, provides an overview of the key issues and identifies development activities likely to impacts social surroundings values. The EPA considers that many impacts to ACH may be mitigated by the *Aboriginal Heritage Act 1972* processes, provided those processes are likely to result in avoidance or minimisation of harm to those sites. Where *Aboriginal Heritage Act 1972* processes are not reasonably likely to meet the EPA's objectives for social surrounding and ACH values, an EPA assessment may still be required.
Technical Guidance Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA, 2023b)	The EPA acknowledges the repealed *Aboriginal Cultural Heritage Act 2021* and has adjusted its Environmental Factor Guideline - Social Surroundings and related Technical Guidance to reflect the role of the amended and restored *Aboriginal Heritage Act 1972*. The Technical Guidance provides additional information on procedures and the EPA's environmental impact assessment process for Social Surroundings under the *Environmental Protection Act 1986* (EPA, 2023b).
Underwater Cultural Heritage Act 2018	Provides for the protection of Australia's shipwrecks and has broadened protection to sunken aircraft and other types of underwater cultural heritage including Australia's Aboriginal and Torres Strait Islander Underwater Cultural Heritage in Commonwealth waters.
Maritime Archaeology Act 1973	The state *Maritime Archaeology Act 1973* protects pre-1900 maritime archaeological sites on state lands and in state waters. Maritime archaeological site types include shipwrecks and relics associated with historic ships.

Legislation, policy and guidance	Consideration
Heritage Act 2018	State legislation that recognises and promotes historic heritage by defining principles for conservation, use, development or adaptation for heritage places. A search of the Heritage Council's Inherit database was undertaken to identify any state and local government listed heritage places proximate to the proposal.

13.3 Environmental investigations

13.3.1 Ethnographic Aboriginal Heritage Survey

Brad Goode and Associates undertook an Ethnographic Aboriginal Heritage Survey of the area shown in Figure 47 to support the proposal (a previous project design) in 2019 (Appendix W). As part of the survey, Brad Goode and Associates undertook the following:

- A search of the DPLH Aboriginal Heritage Inquiry System conducted on 22 January 2019
- Archival research
- Consultations with seven representatives of the Whadjuk NTC group on 5 February 2019.

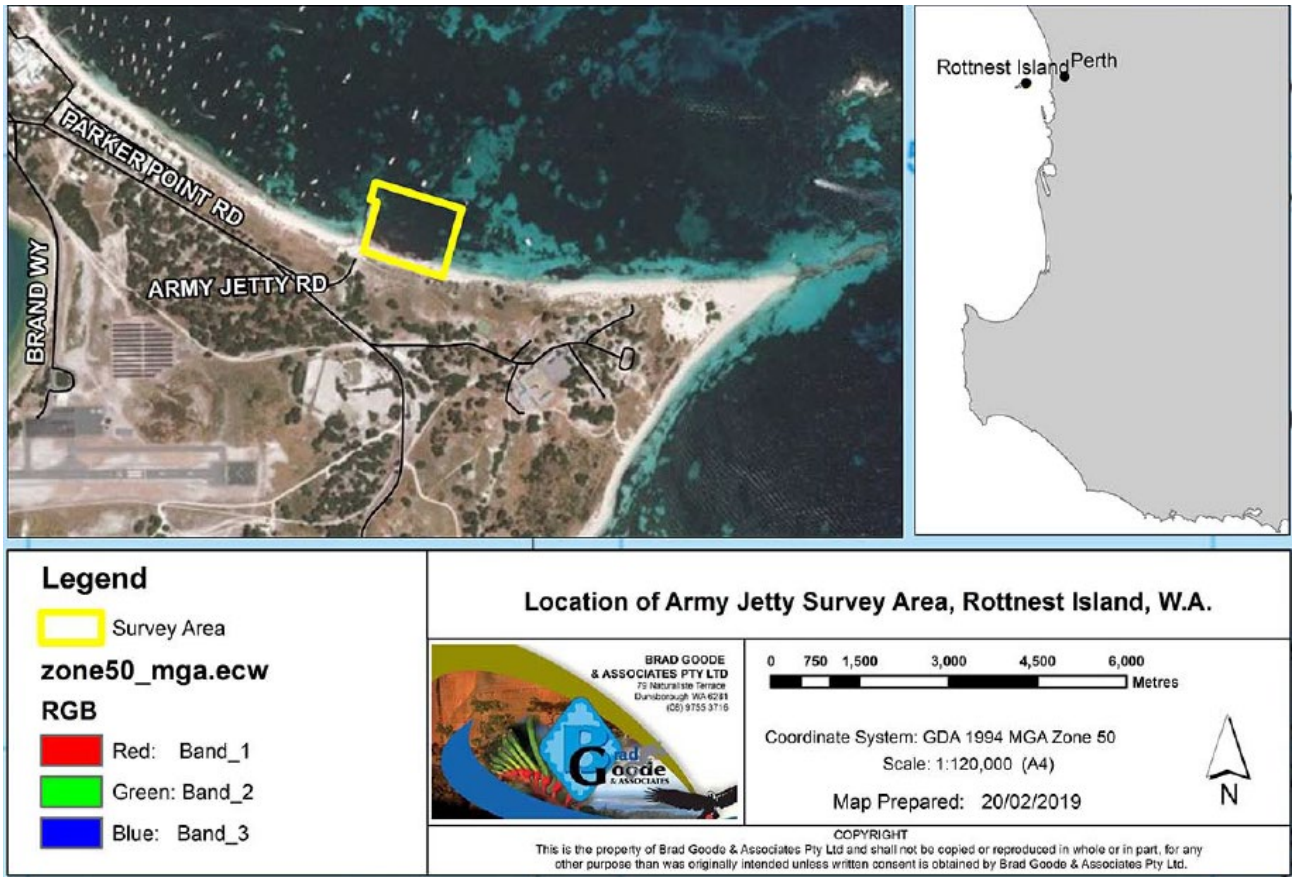


Figure 47: Ethnographic Aboriginal heritage survey area

13.3.2 UXO survey

Surrich Hydrographics undertook a UXO survey in November 2019 over the previously proposed dredge area. The survey area is shown in Figure 48. The survey used the marine magnetic method, which responds to artificial ferrous objects above and below the seabed, as well as magnetic minerals in the seabed geology.

Based on the outcomes of the survey undertaken by Surrich, a follow up survey was undertaken in December 2019 by TAMS Group to resolve the anomalies identified by Surrich.

The South Thomson Bay Magnetic Survey (Surrich, 2019) and Rottnest Island Authority – Geological Investigation – Thomson Bay South and UXO investigation/anomaly recovery report (TAMS Group, 2019) are provided as Appendix T.

Figure 48: UXO survey area (red boundary)

13.3.3 Stakeholder engagement

Stakeholder engagement undertaken to support the proposal is discussed in Section 4 and has included potential impacts to social surroundings such as tourism and recreational values.

13.3.4 Airborne noise assessment

Herring Storer Acoustics undertook an acoustical assessment of noise emissions associated with the existing barge operations at the Main Jetty to ascertain the noise impact that operations at the facility have on surrounding commercial and residential premises. As the only change proposed to the existing barge operations is relocation, the noise assessment can be used to address potential airborne noise impacts from barge activities at the new location.

The criteria considered in the assessment are the Environmental Protection (Noise) Regulations 1997 requirements. These regulations stipulate maximum allowable external noise levels at various types of premises. The baseline assigned outdoor noise levels are provided in the noise assessment report provided in Appendix U.

13.4 Receiving environment

13.4.1 Tourism, recreation and fishing

Wadjemup / Rottnest Island is a popular tourist destination and the Wadjemup / Rottnest Island marine environment is widely used for swimming, boating and fishing. Although swimming is prohibited between the Main Jetty and the Fuel Jetty in South Thomson Bay, recreational swimming occurs elsewhere in the bay, including the development envelope.

Wadjemup / Rottnest Island and the surrounding marine waters are protected by a reserve for public recreation and conservation. The marine waters within the development envelope are within the Rottnest Island Marine Reserve boundary and can be used for recreational fishing, however it is closed to spear fishing and commercial or amateur net fishing (Figure 49). Recreational fishing undertaken in the area (depending on the season) includes rock lobster, abalone, squid, cuttlefish and octopus fishing, crabbing and line fishing.

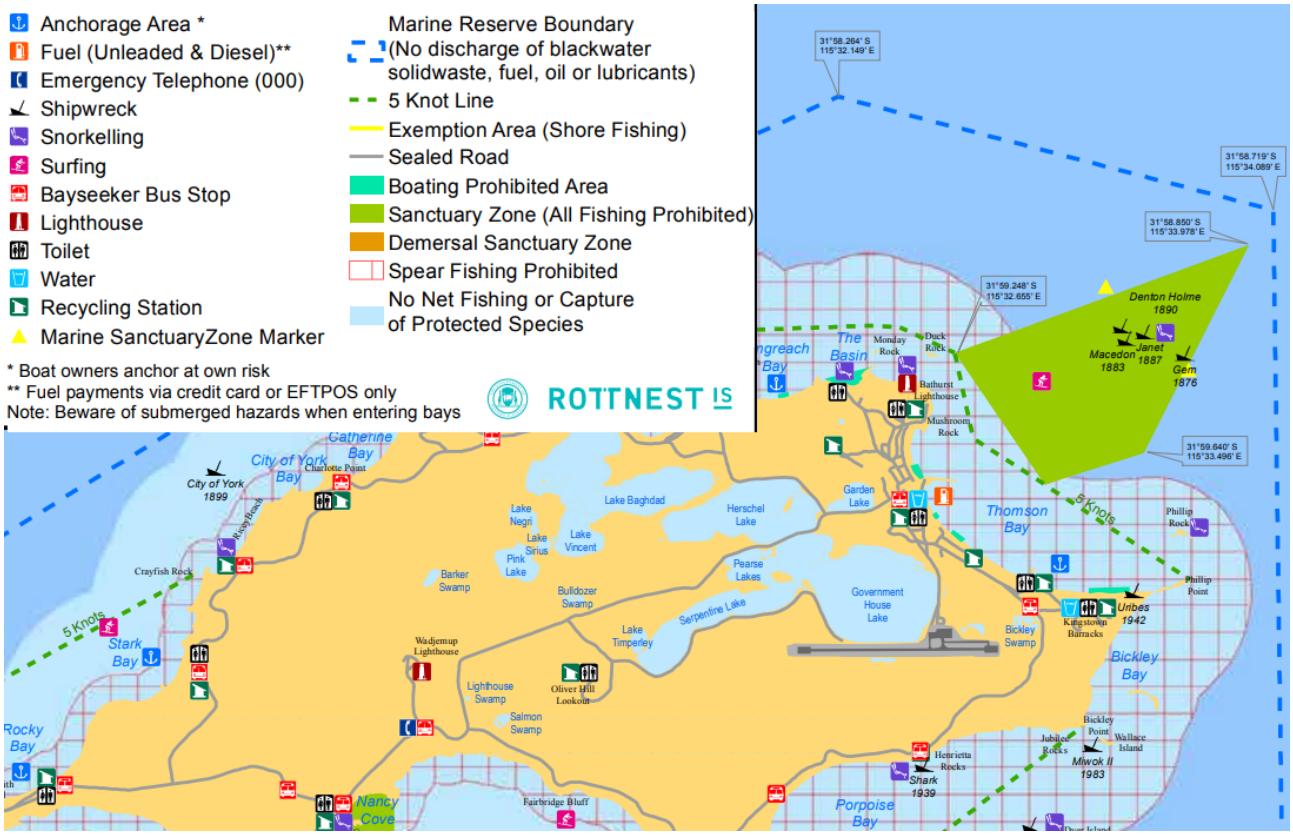


Figure 49: Rottnest Island marine and boating guide reserve map (Rottnest Island Authority 2023)

Recreational boating is a popular activity with the Wadjemup / Rottnest Island marine waters. There are no designated water ski areas within the Rottnest Island Marine Reserve. However, a five-knot speed limit applies in most bays around the island, including South Thomson Bay (Figure 50).

Rottnest Island Authority provides 37 beach anchoring points, 27 of which are located within Thomson Bay. There are also private mooring buoys, which are privately leased and part of the Shared Mooring System and emergency mooring buoys. The location of moorings within vicinity of the site are shown in Figure 55.

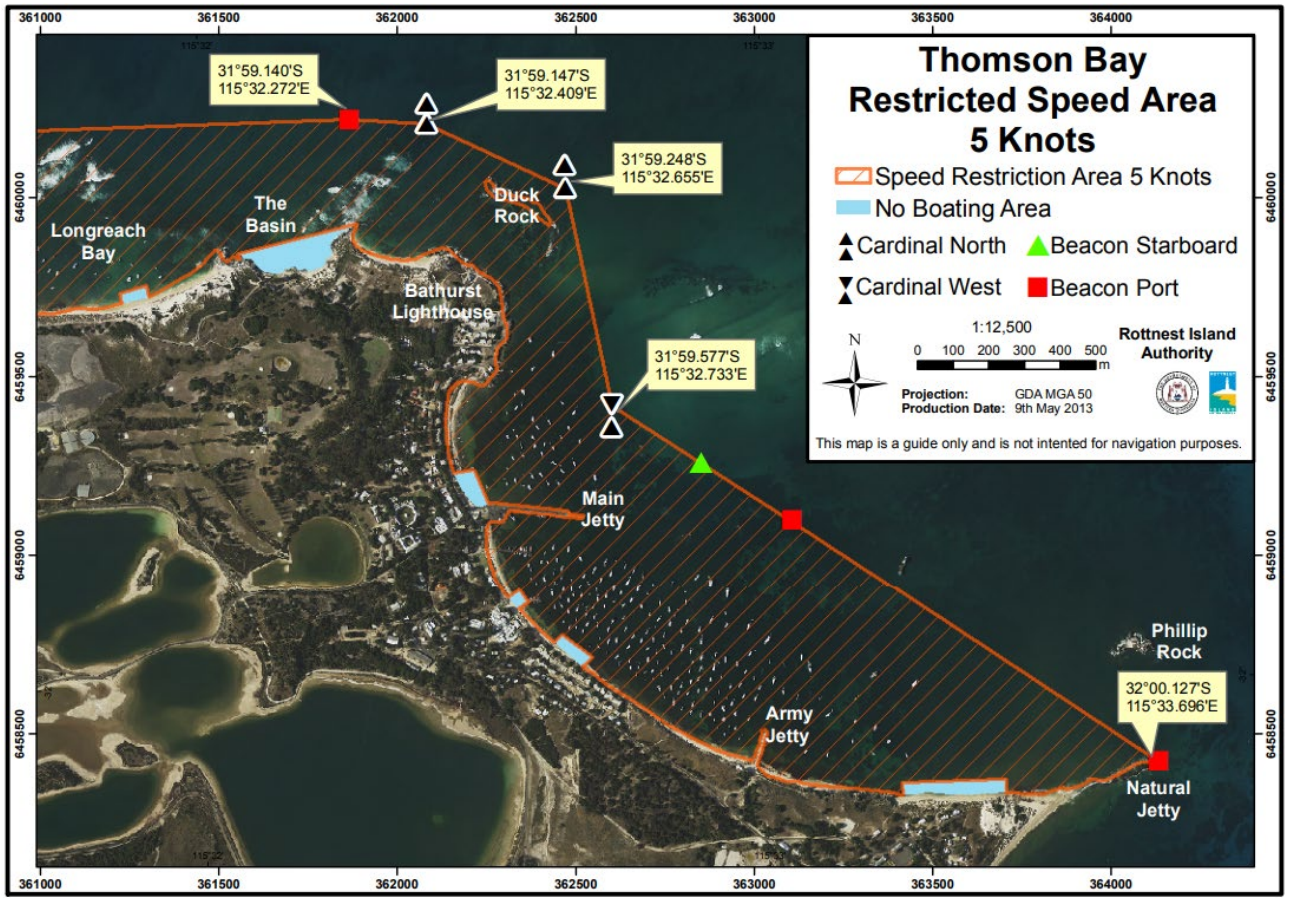


Figure 50: Restricted speed area within Thomson Bay (Rottnest Island Authority, 2013)

13.4.2 Aboriginal heritage

Wadjemup / Rottnest Island is an exceptionally significant and unique cultural heritage landscape. The Traditional Owners of Wadjemup / Rottnest Island are the Whadjuk Noongar people, who hold significant cultural value on the island through its association to several Dreamtime stories concerning death, the 'after life' and the creation of offshore islands. 'Wadjemup' in the Whadjuk Noongar language refers to 'place across the water where the spirits are'. Consequently, the island and area around the development envelope holds significance in intangible (ethnographic) cultural values.

Oral histories and archaeological evidence indicate that Whadjuk occupation of the island dates to over 40,000 years ago, when lower sea levels meant the island was connected to the mainland and formed a low ridge on the pre-inundation Swan Coastal Plain. Chert artefacts found in several locations across the island hold proof of visitation to Wadjemup / Rottnest Island by Aboriginal people. Approximately 7,000 years ago, following sea level rise, Wadjemup / Rottnest Island became an island and visitation by Aboriginal people ultimately ceased. It remained a significant spiritual place in its relation to ancestors and the journey to afterlife.

Wadjemup / Rottnest Island was used as an Aboriginal prison between 1838 and 1931, where Aboriginal people were forced to quarry limestone, construct many buildings in the settlement, farm and mill grain, and mine salt from the saline lakes. State records indicate that 4,000 Aboriginal men and boys from Western Australia were imprisoned on the island. The prisoners were allowed to walk the Island as 'free time' on Sundays and may have visited and carried out cultural practice proximate to the development envelope. At least 373 of the prisoners died in custody and were buried in an area currently referred to as the Wadjemup

Aboriginal Burial Ground. Although this Burial Ground is not located proximate to the development envelope, their spirits remain on the island and as such, the whole of the island has intangible cultural value.

A search of the DPLH's Aboriginal Heritage Inquiry System database was undertaken in April 2024 and did not identify any Aboriginal cultural heritage (ACH) or any registered or lodged sites within or adjacent to the development envelope. The closest registered ACH to the development envelope is Aboriginal Cultural Heritage Register Place 39697. This ACH Place is located over 400 m from the development envelope and will not be impacted by the proposal.

During the Ethnographic Aboriginal Heritage Survey undertaken by Brad Goode and Associates (2019), consultation was undertaken with seven representatives of the Whadjuk NTC group, the outcomes of this consultation are summarised below (Brad Goode and Associates, 2019):

- No new ethnographic sites, as defined by section 5 of the *Aboriginal Heritage Act 1972* were identified. However, the group representatives identified the potential for historical artefacts and chert to occur in the subsurface, and potential burials could be located in the dunes in the vicinity of the development envelope. Traditionally, Noongar people were buried facing east behind sand dunes.
- As no ethnographic sites of significance, as defined by section 5 of the *Aboriginal Heritage Act 1972* were identified, it is recommended that RIAcan proceed with the proposal without undue risk of breaching the *Aboriginal Heritage Act 1972* in relation to ethnographic sites and places.

The proposal was referred through an Activity Notice, as per compliance with the Noongar Standard Heritage Agreement, to SWALSC and the Whadjuk Cultural Advice Committee (WCAC) in March 2024 to confirm whether a more recent survey was required. The Activity Notice included the original survey undertaken by Brad Goode and Associates (2019). SWALSC and WCAC recommended that as long as the actions outlined in Section 13.5.1.2.1 are implemented, then additional heritage surveys are not necessary.

In addition, the Wadjemup Aboriginal Reference Group (WARG) (Pamela Thorley, Walter McGuire, Lindsay Dean, Kathleen Musulin, Casey Kickett and Brendan Moore) were consulted and approved the proposal, noting that the Whadjuk monitors would be present during on ground disturbing works to safeguard the intangible cultural values of the site and any potential cultural artefacts.

13.4.3 Natural and historic heritage

A search of the Heritage Council's Inherit database was undertaken in April 2024, the results are shown in Figure 51.

Wadjemup / Rottnest Island is mapped as a heritage place (place number 03650) by the Heritage Council and is also listed as a heritage place by the Register of the National Estate (indicative place) and National Trust. The values of this heritage place are summarised below:

- The place is rare as a whole island significant for its role in the early establishment of farming, Defence, and imprisonment of Indigenous.
- Significant role in history of contact with Aboriginals and imprisonment.
- The place plays a significant role in Western Australia's early pioneer history and pastoral industry.
- The place has aesthetic value as it contributes to Perth's Sense of place and it is visible from a large portion of Western Australia's coastline.

Kingstown Barracks (Place Number 00525) is located east of the site, although the barracks are not located within or adjacent to the development envelope, the heritage place mapping is located along the eastern boundary of the development envelope as shown in Figure 51. Any impacts to infrastructure and buildings associated with this heritage place have been avoided.

The Commonwealth Heritage List is a list of Indigenous, historic and natural heritage places owned or controlled by the Commonwealth Government that are of significant heritage value. There are no world, national or Commonwealth heritage places within vicinity of the proposal.

Although not a registered heritage site, the Army Groyne was built in 1906 and stakeholder consultation indicates potential community concerns over protection of the heritage values of the jetty (refer to Section 4).

Figure 51: Historic heritage

13.4.4 Shipwrecks

Australia protects its shipwrecks, sunken aircraft and other types of underwater heritage and their associated artefacts through the *Underwater Cultural Heritage Act 2018*. A search of the Australasian Underwater Cultural Heritage Database (DCCEEW, 2023b) identified no historic shipwrecks within or adjacent to the development envelope listed under the Commonwealth *Underwater Cultural Heritage Act 2018*. Furthermore, a search of the Western Australia Shipwrecks Database did not identify any shipwrecks within or adjacent to the development envelope. The closest shipwreck is the *Uribes* (1942/07), which is located approximately 500 m from the eastern edge of the development envelope, and within the ZoI (Figure 52).

As there are no shipwrecks occurring within the development envelope and potential impacts within the ZoI includes temporary increased suspended sediments, impacts to the *Uribes* are not likely to significant and no further mitigation or management is considered necessary.

Figure 52: Social surroundings

13.4.5 Unexploded ordnance

As a result of military training and live firing undertaken by Australian and Allied forces, there are areas throughout Australia (outside Commonwealth land) that may be subject to residual UXO contamination. The Department of Defence has mapped areas at risk of UXO contamination. A review of this mapping indicates that the terrestrial component of the development envelope is mapped as having a slight potential for UXO to occur, while there is a defence sea dumping site approximately 3 km north of the development envelope (Figure 53).

Sites categorised as having a slight potential for UXO to occur are those that have a confirmed history of military activities that often results in numerous residual hazardous munitions, components or constituents; but where confirmed UXO affected areas cannot be defined. Alternatively, sites categorised as slight may have a confirmed history of military activities of a type that sometimes results in occasional residual UXO.

The Department of Defence recommends that, although current land use may continue without further UXO investigation or remediation, consideration should be given to obtaining specialist advice and undertaking a detailed UXO Risk Assessment and developing a UXO Management Plan, as necessary. Consequently, due to the risk for UXOs to occur in the area (Figure 53), Surrich (2019) undertook a magnetic field survey for UXO.

The survey identified 48 ferrous debris targets, six of which were confirmed to be debris and not UXO. Further assessment undertaken by TAMS Group identified that at least ten anomalies require revisits for further confirmation of the UXO risk.

Liaison with RIA has been undertaken to further identify the ferrous targets. Historical photography indicates that the rectangular area to the east of the proposal is likely to be a historical mooring area or enclosed swimming area (Plate 12). The results of the magnetic field survey are provided in Appendix U and shown in Figure 54.

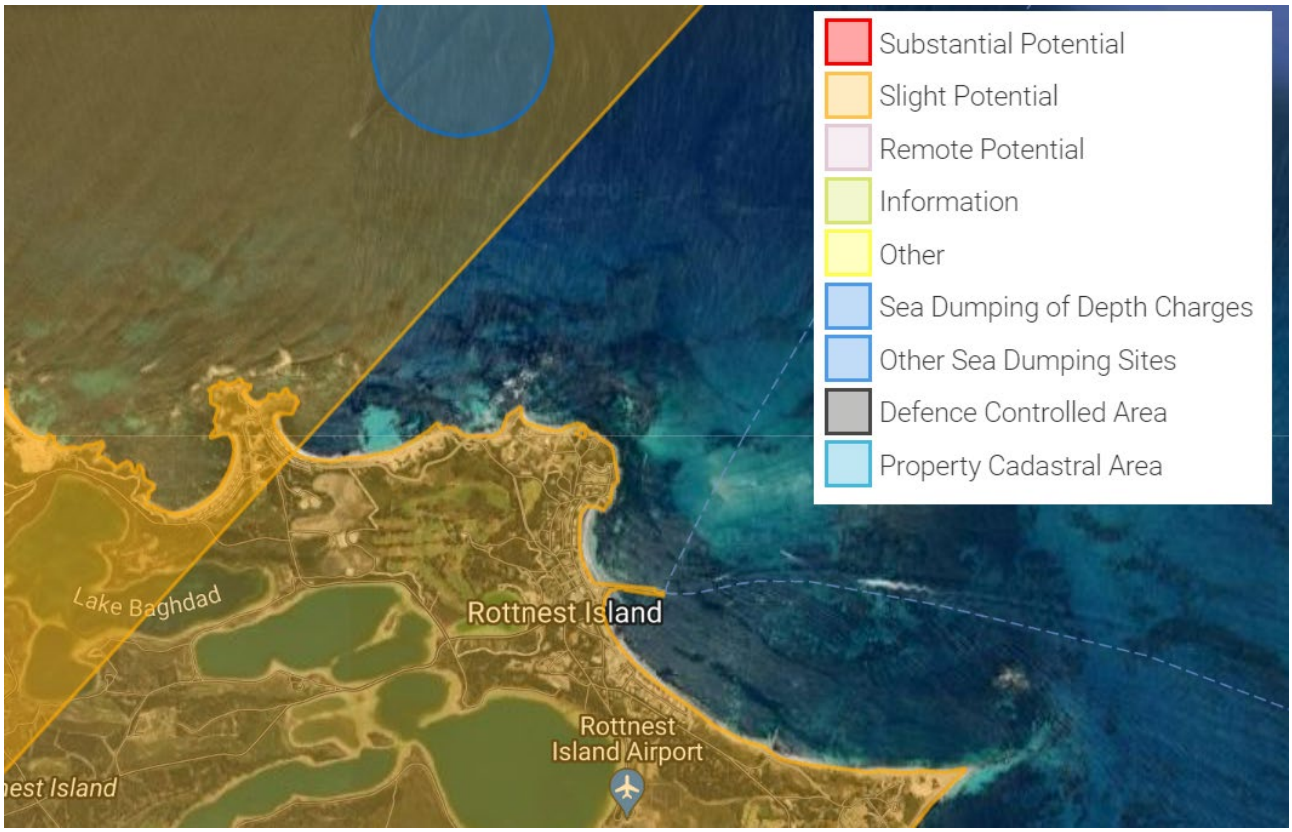


Figure 53: UXO risk mapping

Plate 12: Historical mooring area or enclosed swimming area to the east of the proposal

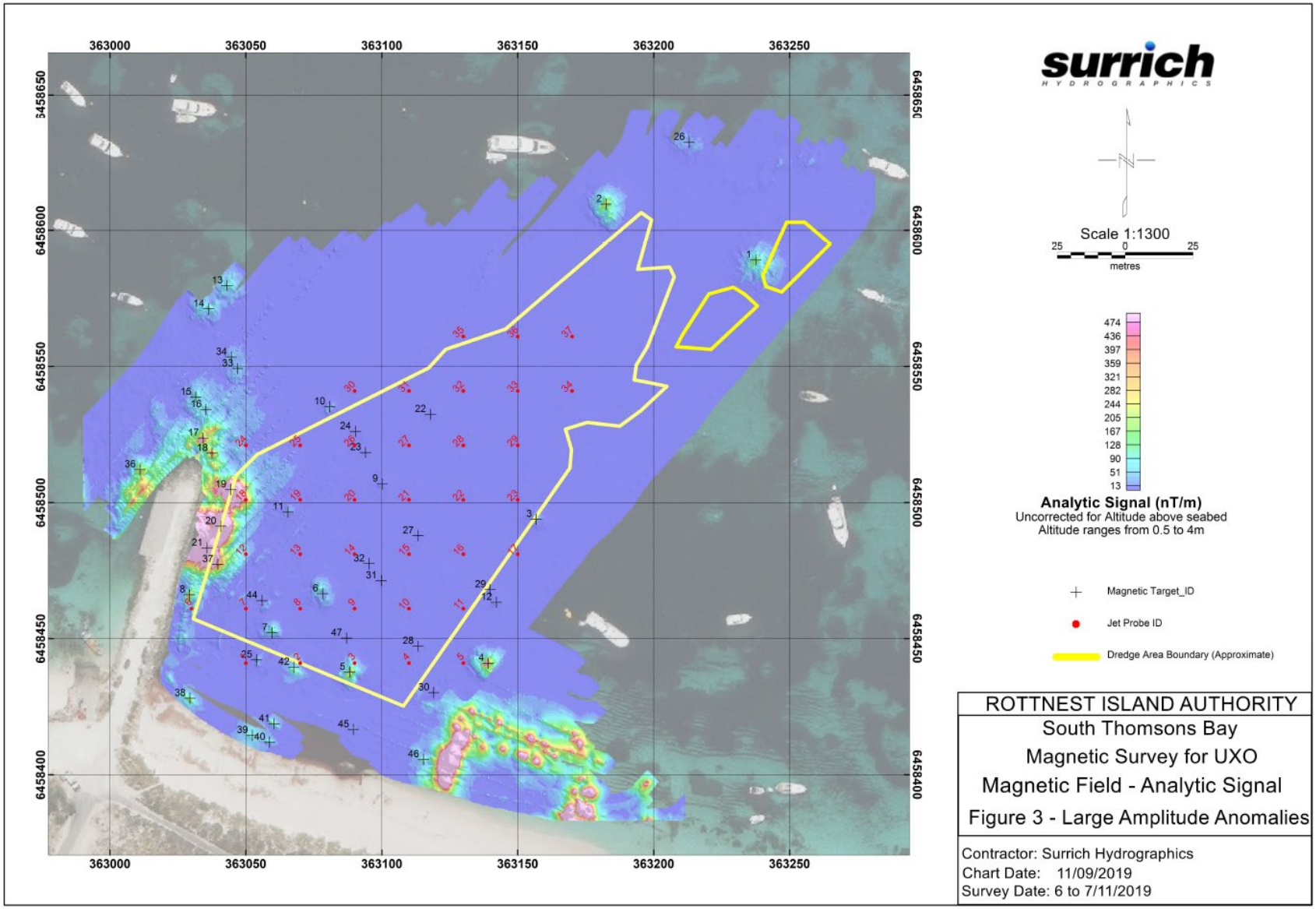


Figure 54: Magnetic field survey for UXO

13.5 Potential environmental impacts

Table 75 provides the potential key impacts to social surroundings from the proposal.

Table 75: Potential impacts on social surroundings

Phase	Impact class	Works/operations	Potential impacts
Construction	Direct	• Ground disturbing activities • Dredging activities	**Potential impacts heritage** • Potential impacts to previously unidentified ACH • Community concerns regarding heritage values of the Army Groyne **Impacts to recreational values** • Construction of the proposal will require the temporary relocation of some moorings **Potential disturbance of UXO** • There is a risk for dredging and ground disturbing activities to disturb UXO.
	Indirect	• Construction of the offshore project components	**Impacts to recreational values** • The minor loss of marine habitat may have consequences for recreational fisheries in the South Thomson Bay through the loss of potential feeding and spawning habitat • Construction of the proposal has potential to impact public safety, such as swimmers and recreational beach users **Impact to amenity** • Construction of the proposal has the potential to impact amenity.
Operation	Indirect	• Offshore project components	**Impacts to recreational values** • Implementation of the proposal will result in the relocation of some moorings and loss of informal moorings • Operation of the proposal has potential to impact public safety, such as swimmers and recreational beach users **Impact to amenity** • The proposal has the potential to impact amenity.

13.5.1 Assessment of impacts

13.5.1.1 Impacts to recreational values

13.5.1.1.1 Relocation of moorings

Construction and operation of the proposal will require the temporary and permanent relocation of some moorings during construction and operation as summarised below and shown in Figure 55:

- Temporary relocation of eight moorings during construction of the proposal. The temporary relocation will be undertaken prior to construction commencing to minimise disruption to users. The relocation will be for the duration of construction, for approximately 18 months.
- The permanent relocation of four moorings will be undertaken prior to construction to minimise disruption to users.
- No moorings will be permanently removed.

Rottnest Island Authority has undertaken consultation with the mooring licensees regarding the proposal and will work with the impacted mooring licensees. Consultation undertaken to date regarding relocation of moorings is provided in Section 4.

13.5.1.1.2 Impacts to recreational fishing

Loss of marine habitat, primarily the loss of seagrass associated with construction of the proposal has the potential to result in indirect impacts to marine fauna species through loss of foraging opportunities and changes to marine environmental quality. This minor loss of marine habitat may have consequences for recreational fisheries in the bay through the loss of potential feeding and spawning habitat.

Potential impacts to marine fauna and habitat as a result of changes in water quality are discussed in more detail in Sections 7.5.1.1, 9.5.1.1 and 10.5.1.1 and is summarised below:

- Direct (permanent) impacts to 2.06 ha of mixed seagrass and 1.26 ha of sand / sand with wrack within the development envelope
- 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI will recover within a five-year period
- 5.13 ha of mixed seagrass, 1.13 ha macroalgae dominated community, 0.35 ha of limestone reef / pavement and 6.70 ha of sand / sand with wrack within the ZoI. Changes in environmental quality associated with dredge plumes in the ZoI are not predicted to result in a detectible impact on benthic biota.

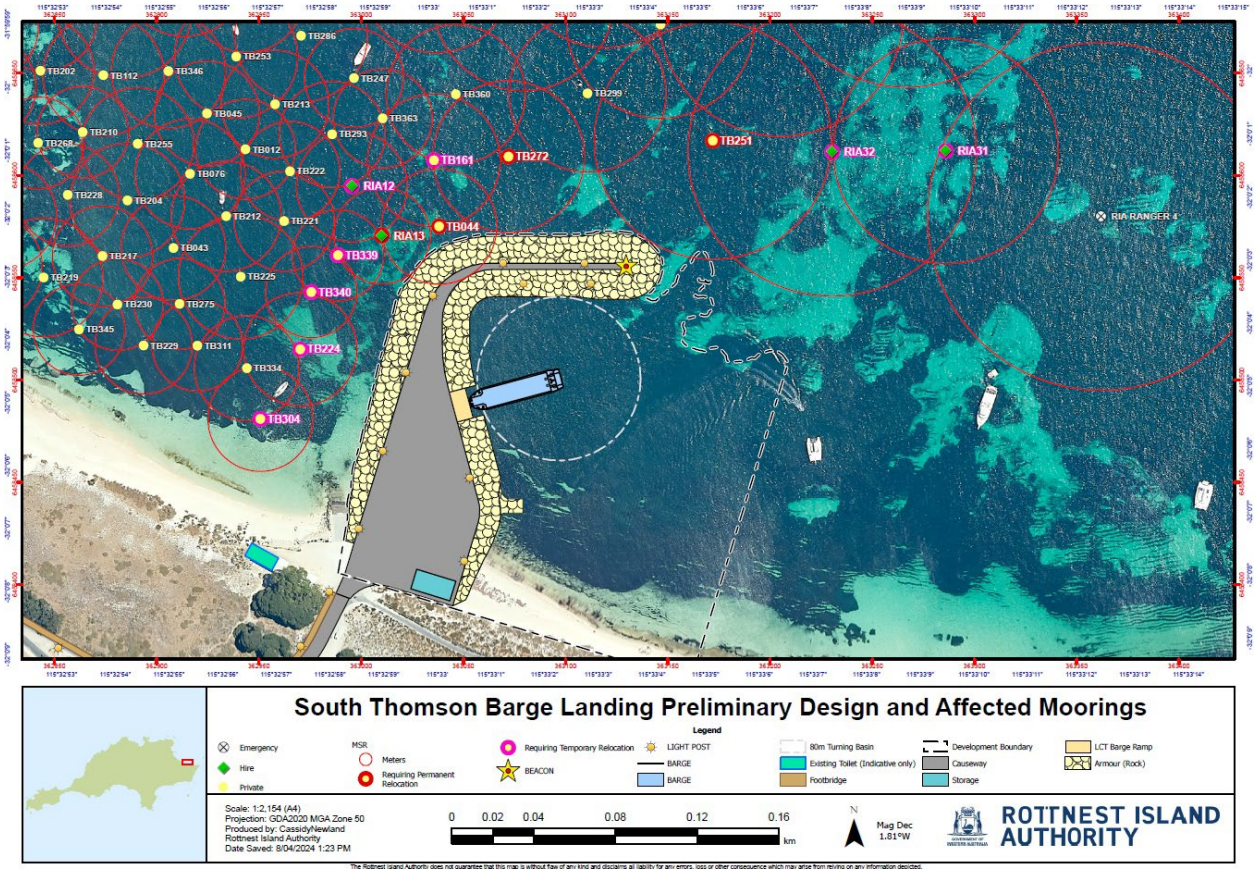


Figure 55: Location of impacted moorings

13.5.1.1.3 Impacts to public safety

There is potential for impacts to public safety during construction and operation of the proposal as summarised below:

- There is a risk to marine traffic during construction and operation of the proposal. However, as the Department of Transport (DoT) determined that a navigational channel and markers were not required, the risk to boating users from the relocation of barge traffic is not expected to be significant.
- Potential safety risks to swimmers within vicinity of the proposal. However, as RIA will install floating markers and signs at the entrance to the barge landing (within the development envelope) to prevent boat anchorage and swimming, this risk is unlikely to be significant.

13.5.1.2 Impacts to heritage

13.5.1.2.1 Aboriginal heritage

There are no registered ACH sites within the development envelope and the consultation undertaken in both 2019 and 2024 with the Whadjuk NTC group, SWALSC and WCAC confirmed that RIA can proceed with the proposal without undue risk of breaching the *Aboriginal Heritage Act 1972* in relation to ethnographic sites and places.

The consultation undertaken with Aboriginal groups, as outlined above, recommended the following:

- Archaeological monitors are present during all ground disturbing works and that archaeological techniques, such as test pitting and sieving, are employed if artefacts are found. The WCAC have selected the monitors to take part and have provided details to the RIA heritage team.
- Due to the spiritual sentiment associated with the area, a proprietary ritual (Welcome to Country and Smoking Ceremony) will be performed prior to the works occurring.
- Interpretative signage will be installed at the site to provide people visiting the island with more information about Aboriginal history of the area.

In addition to the above, actions proposed by the RIA Heritage team include:

- Availability to hold Smoking ceremonies throughout the project should the Whadjuk Traditional Owners request the need to do so.
- Cultural heritage inductions for all project members to be undertaken by a senior Whadjuk Elder at the commencement of the project, covering spiritual, physical and intangible values.

As indicated above, there is risk for previously unearthed artefacts or burials to be identified during ground disturbing activities. The risk of this will be managed through implementation of the CEMP, which includes the requirement for archaeological monitors to be present during all ground disturbing works.

13.5.1.2.2 Historic heritage

There are no registered cultural heritage sites within the development envelope and the Army Groyne is not registered as a heritage site. Therefore, there will be no significant impacts to registered cultural heritage as a result of implementing the proposal. However, the Army Groyne was constructed in 1906 and there are community concerns regarding impacts to the heritage values of the site. These concerns will be addressed in ongoing consultation regarding the proposal.

Ongoing stakeholder engagement has been undertaken with the Heritage Council as summarised in Section 4. This engagement indicates that the Heritage Council has no significant concerns regarding the proposal, as long as impacts to the Kingstown Barracks are avoided (David Pond, personal communication, 12 July 2024).

13.5.1.3 Impacts to amenity

Potential impacts to amenity resulting from the proposal are summarised below:

- Potential noise emissions to air from construction and operation of the proposal.
  - Kingston Barracks and the South Thomson Bay units are located approximately 500 m from the proposal. The construction and operation of the proposal will generate noise emissions that may result in a reduction of amenity in the immediate area of the source.
  - An airborne noise assessment was undertaken of the current barge operations (Appendix U). Noise emissions from the existing operations at the Rottnest Barge Facility comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997 at all times (Herring Storer, 2024).
  - As the existing barge operations comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997, it is predicted that the relocated operations will also comply with the regulations and no significant noise impacts from the proposal are anticipated.
- Changes to visual amenity within the vicinity of the proposal.

  - As there is an existing groyne within the development envelope, extension of this groyne to support the proposal is unlikely to result in a significant change to visual amenity.
- Potential for items or materials (e.g. waste) to be transported through the proposed facility during operations which may result in odour emissions. The risk of significant impacts from odour emissions is low as the majority of materials transported through the new facility are inert with low potential for odour. The transport of waste compactors through the facility will be limited to set times to further reduce the risk of impacts to amenity.
- Potential visual amenity impacts from artificial lighting will be minimised where safety allows. Lighting will be limited to specific purposes such as to ensure the safety of vessels and public at night and will be in accordance with the following:
  - Australian Standard DR AS/NZS 1158.3.1:2018 Lighting for roads and public spaces pedestrian area (Category P) lighting
  - Australian Standard AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting
  - National light pollution guidelines for wildlife (DCEEW, 2023).

13.5.1.4 Disturbance of UXOs

As discussed in Section 13.4.5, Wadjemup / Rottnest Island has been categorised by the Department of Defence with a residual UXO potential as slight.

Although the marine component of the development envelope was not mapped as having a risk of UXO occurring, the marine environment approximately 3 km to the north-west of the site is at risk of UXO occurring. Due to the risk of UXO in the area, Surrich (2019) undertook a magnetic field survey for UXO to further delineate the risks. The survey identified 48 ferrous debris targets, six of which were confirmed to be debris and not UXO.

As there are ferrous debris targets within the development envelope that may be UXO, there is a risk for dredging and ground disturbing activities to disturb UXO.

13.6 Mitigation

Table 76 demonstrates how the EPA's mitigation hierarchy (avoid, minimise and rehabilitate) has been applied to the environmental factor of social surroundings to address the key potential impacts.

Table 76: Application of mitigation hierarchy to social surroundings

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
Impacts to recreational values (recreational fishing)	Indirect	Avoid	• Complete avoidance of indirect impacts to potential marine fauna habitat is not avoidable.	**No residual impacts expected** Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna habitat that may indirectly impact recreational fishing. Implementation of these management plans ensures that impacts to marine environmental quality outside the ZoI, ZoMI and ZoHI from a temporary increase in suspended sediments are unlikely and residual impacts to recreational fishing are not considered significant.
		Minimise	• Management and mitigation proposed during construction to minimise impacts to benthic communities and habitats is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that the area of benthic communities and habitats permanently impacted by the proposal is limited to the development envelope • Management and mitigation proposed during construction to minimise impacts to marine environmental quality, which may result in impacts to recreational fishing, is detailed in the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O). Implementation of these management plans will ensure that: – The area affected by reduced water quality (suspended sediments) during dredging and construction will be limited (wherever possible) and will not extend past the modelled ZoHI, ZoMI and ZoI – Marine environmental quality will be maintained at a moderate level of ecological protection during dredging and return to a High Level of Ecological Protection within two weeks following completion of dredging • Implementation of the CEMP and DEMMP provides the monitoring and management framework to address potential impacts to marine environmental quality during construction that may indirectly impact recreational fishing values. Key management and monitoring measures include: – Implementation of the Marine Water Quality Monitoring Program (MWQMP) provided in the DEMMP for suspended sediment – Inspections of all dredge equipment to check for leaks or damage • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Emerge, 2025b) (Appendix Q). • Maintenance dredging (if required) will be undertaken in previously disturbed / sandy areas within the development envelope / project footprint where possible. Maintenance dredging frequency, volumes and disposal will be determined as required. Environmental management and monitoring will be undertaken in a manner that is consistent with the document Maintenance Dredging Environmental Management Framework (BMT Oceanica, 2016) prepared for Department of Transport for similar types of maintenance dredging activities. • Marine users to comply with vessel operational restrictions required by DoT and RIA.	
		Rehabilitate	Construction effects (outside the development envelope) on recreational fishing will be temporary and natural amelioration will mitigate or remove long-term impacts following cessation of construction activities.	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	
Impacts to recreational values (public safety)	Direct	Avoid	• The proposed upgrades to the Army Groyne will reduce public safety risks and improve the overall visitor arrival experience • The Department of Transport (DoT) determined that a navigational channel and markers were not required and that the risk to boating users from the relocation of barge traffic is not expected to be significant • Complete avoidance of impacts to recreational values during construction and operation of the project cannot be achieved.	**No residual impacts expected** Significant residual impacts to social surroundings (recreational values; public safety) from implementation of the proposal are considered unlikely and will be minimised through implementation of the CEMP and OEMP.
		Minimise	• Implementation of the CEMP provides the monitoring and management framework to minimise risks to public safety during construction. Key management and monitoring measures include: – Equipment will be fitted with noise control devices where possible and appropriate – Implementation of vehicle speed limits – Installation of floating markers and signs to limit access to the construction areas within both the marine and terrestrial environment • Operational management to minimise impacts to the marine environment is detailed in the OEMP (Emerge, 2025b) (Appendix Q). Implementation of this management plan will ensure that: – Installation of floating markers and signs at the entrance to the barge landing (within development footprint) to prevent boat anchorage and swimming. This will ensure that an increase in vessel movements does not impact public safety – Physical inspections during operations – Maintenance of a complaints register – Public safety risk (i.e. traffic along Parker Point Rd) is addressed by policing and road regulations applicable to Wadjemup's / Rottnest Island's roads – Marine users to comply with vessel operational restrictions required by DoT and RIA.	
		Rehabilitate	Rehabilitation is not considered applicable to social surroundings.	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	
Relocation of moorings	Direct	Avoid	Complete avoidance of disruption to mooring users is not possible.	**Permanent relocation of four moorings** Disruption to moorings users has been minimised through relocating all impacted moorings, rather than removing them. Significant residual impacts to social surroundings (impacts to moorings) from implementation of the proposal are considered unlikely.
		Minimise	• No moorings will be permanently removed and disruption to moorings users will be minimised through: – Temporary relocation of eight moorings during construction of the proposal. The temporary relocation will be undertaken prior to construction commencing to minimise disruption to users. The relocation will be for the duration of construction, for approximately 18 months – The permanent relocation of four moorings will be undertaken prior to construction to minimise disruption to users • Ongoing stakeholder consultation with the local community regarding the proposal and potential impacts on social surroundings.	
		Rehabilitate	All impacted moorings are proposed for relocation (rather than removal).	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	
Impacts to previously unidentified ACH	Direct	Avoid	• There are no registered ACH sites within the development envelope • Consultation with representatives of the Whadjuk NTC group confirmed that the proposal can proceed without undue risk of breaching the *Aboriginal Heritage Act 1972* in relation to ethnographic sites and places. • Additional consultation was undertaken with SWALSC, WCAC and WARG in 2024.	**No residual impacts expected** Significant residual impacts to social surroundings (ACH) from implementation of the proposal are considered unlikely.
		Minimise	• To minimise potential impacts to any previously unidentified subsurface ACH, the following actions will be implemented as per the recommendations from the Aboriginal groups that were consulted: – Archaeological monitors are present during all ground disturbing works and that archaeological techniques, such as test pitting and sieving, are employed if artefacts are found. – A proprietary ritual (Welcome to Country and Smoking Ceremony) will be performed prior to the works occurring. – Interpretative signage will be installed at the site to provide people visiting the island with more information about Aboriginal history of the area. – Availability to hold Smoking ceremonies throughout the project should the Whadjuk Traditional Owners request the need to do so.	

Potential environmental impacts	Impact class	Mitigation hierarchy	Proposed mitigation measures	Residual impacts
			– Cultural heritage 'Welcome to Country' for all project members to be undertaken by a senior Whadjuk Elder at the commencement of construction, covering spiritual, physical and intangible values. – Cultural heritage inductions to be undertaken by an RIA Heritage person for new project members after commencement. • Ongoing consultation will be undertaken with Traditional Owners as required to determine additional Aboriginal heritage information about potential sites. •	
		Rehabilitate	Rehabilitation is not considered applicable to social surroundings.	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	
Impacts to amenity	Indirect	Avoid	Complete avoidance of impacts to amenity is not possible.	**No residual impacts expected** Significant residual impacts to social surroundings (amenity) from implementation of the proposal are considered unlikely to be significant with implementation of the CEMP and OEMP.
		Minimise	• Ongoing stakeholder consultation with the local community regarding the proposal and potential impacts on social surroundings • As there is an existing groyne within the development envelope, extension of this groyne to support the proposal is unlikely to result in a significant change to visual amenity • An airborne noise assessment was undertaken of the current barge operations (Appendix U). Noise emissions from the existing operations at the Rottnest Barge Facility comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997 at all times (Herring Storer, 2024). As the existing barge operations comply with the criteria set out by the Environmental Protection (Noise) Regulations 1997, it is predicted that the relocated operations will also comply with the regulations and no significant noise impacts from the proposal are anticipated • Management targets and actions to minimise potential impacts to amenity from increase in noise, lighting, odour and dust from construction of the proposal are outlined in the CEMP (Appendix P). The management targets include: – Noise emissions do not exceed assigned noise levels as prescribed in the Environmental Protection (Noise) Regulations 1997 – No fugitive dust emission outside of the development envelope – Zero incidences of fire resulting from the proposal • Key management measures outlined in the CEMP to achieve these targets include: – Construction contractor specifications will require that all construction work will be carried out in accordance with control of noise practices set out in Section 4 of Australian Standard 2436 Guide to Noise Control on Construction, Maintenance and Demolition Sites – Vehicle operation will occur during prescribed hours (between 07:00 and 19:00) – Equipment will be fitted with noise control devices where possible and appropriate – Implement dust suppression measures – Enforce speed limits – Provision of facilities to ensure waste is appropriately disposed • Management targets and actions to minimise potential impacts to amenity from increase in noise, lighting, waste and odour and dust from construction of the proposal are outlined in the OEMP (Emerge, 2025b) (Appendix Q). The management targets include: – Limit the impact on social surroundings, including noise, dust and visual intrusion through controlled vehicle movement procedures, to avoid public and community issues – Limit issues related to freight operations that may cause potential negative impacts on social surroundings – Ensure waste disposal measures and prevent rubbish and litter impact on visual amenity Ensure local amenity is protected and public safety measures are undertaken • Key management measures outlined in the OEMP to achieve these targets include: – Dust management measures: ○ Vehicle movements will be restricted to the designated access roads to minimise dust impacts to surrounding users ○ Vehicle speeds will be restricted to minimise the generation of dust – Waste management measures: ○ Ensure all waste is either recycled or moved off site to the Island disposal facility – Noise management measures: ○ Equipment will be fitted with noise control devices where possible and appropriate – Lighting management measures: ○ The use of lighting at night will be for safety purposes only and will be designed to minimise impacts to surrounding users as much as possible ○ Adaptive light controls to manage light timing, intensity and colour will be implemented to minimise impacts from lighting ○ Only add light for specific purposes such as navigational and safety ○ Light only the object or area intended through lighting placement and design (e.g. placement of lights close to the ground, ensuring lights are directed and shielded to avoid light spill) ○ Use the lowest intensity lighting appropriate for the task ○ Use non-reflective, dark-coloured surfaces ○ Use lights with reduced or filtered blue, violet and ultra-violet wavelengths – Odour management measures: ○ Odour generated from waste compactors will be managed through short transfer intervals, which are currently removed on Tuesdays and Thursdays between 11.00 am and 3.00 pm. The remainder of items transported through the new facility are inert with low potential for odour.	
		Rehabilitate	Rehabilitation is not considered applicable to social surroundings.	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	
Disturbance of UXO	Direct	Avoid	As dredging and ground disturbing activities are required as part of the proposal, complete avoidance of risks is not possible.	**No residual impacts expected** With implementation of the measures in the CEMP, significant residual impacts to social surroundings (UXO risk) are considered unlikely.
		Minimise	• Surrich (2019) and TAMS Group (2019) undertook a magnetic field survey for UXO to delineate the risks of disturbing UXO. An additional UXO survey, prior to construction works, will be undertaken to further assess anomalies identified during the initial UXO survey • Management targets and actions to minimise potential impacts to social surroundings from the risk of disturbance to UXOs from construction of the proposal are outlined in the CEMP (Appendix P). The management targets include: – Minimise risk of disturbance to UXO site.	
		Rehabilitate	If the resurveyed ferrous debris targets are identified as UXO, appropriate remediation and management will be undertaken.	
		Offset	Social surroundings offsets are not considered applicable to the proposal.	

13.7 Assessment and significance of residual impact

The residual impacts to social surroundings after the application of the mitigation hierarchy outlined in Table 76 are summarised below:

- The permanent relocation of four moorings.

The predicted residual impacts to social surroundings from the proposal are not considered significant as discussed in Table 77.

Table 77: Consideration of the significance of the residual impacts on social surroundings

Matters for consideration	Response
The object and principles of the EP Act	Ongoing stakeholder consultation has been undertaken to address potential impacts to social surroundings and the following technical investigations undertaken: • Report of an Ethnographic Aboriginal Heritage Survey of the Army Jetty, Rottnest Island, Western Australia (Brad Goode and Associates, 2019) • Marine magnetic survey at proposed barge landing site, South Thomson Bay (Surrich, 2019) and Rottnest Island Authority – Geological Investigation – Thomson Bay South and UXO investigation/anomaly recovery (TAMS Group, 2019) • Acoustic assessment Rottnest Barge Facility Rottnest Island (Herring Storer, 2024). The principles of the EP Act have been specifically addressed in relation to the proposal (Table 26).
Values, sensitivity and quality of the environment which is likely to be impacted	Direct impacts to social surroundings include the relocation of four moorings. There will be no loss or removal of any moorings. Apart from the recreational values (boating and fishing), there are no other significant social surroundings within or directly adjacent to the development envelope.
All stages and components of the proposal (such as any infrastructure required for the proposal to be practicably implemented, or a proposal life cycle)	All stages of the proposal (i.e. construction and operation) have been included in this impact assessment.
Extent (intensity, duration, magnitude, and geographic footprint) of the likely impacts	Construction of the proposal will result in the relocation of four moorings. Implementation of the CEMP and OEMP will ensure that indirect impacts to social surroundings will be minimal and localised to the development envelope.
Resilience of the environment	There are no ACH or registered heritage sites within or adjacent to the development envelope. Apart from the recreational values, there are no other significant social values within or directly adjacent to the development envelope. Given no significant impacts to social values are expected, the environment is expected to be resilient to change. Therefore, the social values within and adjacent to the development envelope are considered resilient to potential impacts and changes.
Consequence of the application of the mitigation hierarchy to the proposal.	The WA Offsets Guidelines (Government of Western Australia 2014) identifies four levels of significance for residual impacts: • Unacceptable impacts – those impacts which are environmentally unacceptable or where no offset can be applied to reduce the impact. Offsets are not appropriate in all circumstances, as some environmental values cannot be offset. • Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at a critical level. • Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystem requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement • Impacts which are not significant – impacts which do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset. Following the application of the mitigation hierarchy outlined in Table 76 and taking into consideration the above significance of residual impacts model, RPS considers that there are no significant residual impacts to social surroundings from the proposal.

Matters for consideration	Response
Level of confidence in the prediction of residual impacts and the success of proposed mitigation	Stakeholder consultation will be ongoing to ensure the success of the proposed mitigation, resulting in a high level of confidence in the prediction of residual impacts.
Public interest about the likely effect of the proposal or scheme, if implemented, on the environment, and relevant public information	RIA has facilitated regular meetings / dialogue with the local community and key stakeholders (Table 25) as part of the project.

Cumulative impacts from the proposal have been considered in relation to other proposals within 5 km of the proposal and are discussed in Section 18.

Holistic impacts are discussed in Section 17.

13.8 Environmental outcomes

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the proposal, the environmental outcomes that apply to social surroundings are:

- No exceedance of Environmental Protection (Noise) Regulations 1997.
- No reduction in recreational fishing values outside the development envelope and ZoMI which are attributable to the proposal.
- The risk for disturbance to UXO is managed so that there is not a significant risk for injury to people or wildlife, or damage to infrastructure.
- No impacts to registered ACH sites, either through direct disturbance or indirect impacts to ACH within South Thomson Bay.
- No impacts to amenity values from noise, odour and dust within South Thomson Bay during construction and operation of the proposal which result in a reduction in recreational values.

Adaptive management measures will be implemented in accordance with the CEMP, DEMMP and OEMP to ensure these environmental outcomes are met.

As the impact assessment identified no significant residual risks to social surroundings following the application of mitigation actions identified herein, it is considered that the proposal will successfully meet the EPA's objective to protect social surroundings from significant harm.

14 OTHER ENVIRONMENTAL FACTORS OR MATTERS

14.1 EPA environmental factors

This Environmental Supporting Report addresses the following key environmental factors in Sections 7 to 13:

- Benthic communities and habitats (Section 7 of this document)
- Coastal processes (Section 8 of this document)
- Marine environmental quality (Section 9 of this document)
- Marine fauna (Section 10 of this document)
- Terrestrial flora and vegetation (Section 11 of this document)
- Terrestrial fauna (Section 12 of this document)
- Social surroundings (Section 13 of this document).

Other environmental factors which are unlikely to be significantly impacted by the proposal, and how they relate to the proposal, is discussed in Table 78.

Table 78: Overview of other environmental factors

Environmental factor	Objective	Relevance to the proposal
Land		
Landforms	To maintain the variety and integrity of significant physical landforms so that environmental values are protected.	No significant landforms are present within the development envelope that would be impacted by the proposal.
Subterranean fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	The proposal will not involve the abstraction of groundwater or significant excavations. Impacts on subterranean fauna are unlikely.
Terrestrial environmental quality	To maintain the quality of land and soils so that environmental values are protected.	A search of DWER's Contaminated Sites Database identified that no known contaminated sites are within the development envelope. The closest registered contaminated site is located approximately 0.9 km west of the development envelope and is described below: • Site ID 39676 (portion of Lot 10976 on Deposited Plan 216860); hydrocarbons are present in groundwater below the registered contaminated site. • Marine water in Thomson Bay has been sampled between August 2000 and July 2005, and in the majority of these sampling events no contaminants were detected. Minor concentrations of hydrocarbons were detected during three sampling events in June 2002, June 2004 and December 2004. However, contaminants have never been detected in Thomson Bay at concentrations exceeding marine water guidelines. • The registered site has been remediated such that it is suitable for public open space and public roads but may not be suitable for the construction of enclosed buildings, as such, the site is classified as 'remediated for restricted use'. As no groundwater abstraction will occur as part of the proposal and hydrocarbons were not detected in Thomson Bay at concentrations exceeding marine water guidelines, this contaminated site is unlikely to impact the proposal. Implementation of the CEMP, DEMMP and OEMP will minimise risk to terrestrial environmental quality resulting from construction and operation of the proposal.

Environmental factor	Objective	Relevance to the proposal
		Acid sulfate soils (ASS) are naturally occurring soils containing iron sulfide minerals formed under saturated anoxic conditions. In an undisturbed state below the water table, these soils are benign and non-acidic. However, if the soils are exposed to the atmosphere through activities such as drainage, excavation or dewatering, the sulfides may react with oxygen to form sulfuric acid. A review of DWER's ASS mapping indicates that there is a low risk of ASS occurring within the development envelope.
Water		
Inland waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	There are no surface water features within the development envelope. Surface water features within vicinity of the proposal includes: • Bickley Swamp, approximately 180 m to the south, across Parker Point Road and Kingstown Road • Government House Lake is approximately 500 m to the west across Parker Point Road and Brand Way. As no groundwater abstraction will occur as part of the proposal and there are no surface water features within or directly adjacent to the development envelope, impacts to inland waters are unlikely. Impacts will be further minimised through implementation of the CEMP, DEMMP and OEMP.
Air		
Air quality	To maintain air quality and minimise emissions so that environmental values are protected	The proposal is unlikely to significantly impact air quality as summarised below: • As the barge operations are already undertaken at the Main Jetty and are proposed to be relocated to the development envelope, the proposal will not result in a change in emissions and air quality within the area. • Implementation of the CEMP will ensure impacts to air quality are minimised during construction.
Greenhouse gas emissions	To reduce net greenhouse gas emissions in order to minimise the risk of environmental harm associated with climate change	A greenhouse gas assessment was undertaken by Kewan Bond (2024) (Appendix L) to support the proposal. The findings of the assessment are summarised below: • As the proposal is for the relocation of existing barge operations, rather than new operations and activities, only minimal changes to the existing operational greenhouse gas emissions are anticipated. • A minor increase in operational emissions is expected due to the additional distance of the proposed barge landing from the main island settlement and the expected future increase in barge activities, which would involve an increase in fuel consumption and greenhouse gas emissions. However, the increase in barge activities would occur at the existing barge facilities and therefore, these increased emissions would occur even if the proposal were not implemented. • The EPA considers greenhouse gas emissions a significant factor if Scope 1 or Scope 2 emissions are reasonably likely to exceed 100,000 tonnes CO2-e of emissions in any year (EPA, 2023d). • A summary of the scope 1, 2 and 3 emissions estimated from construction and operation of the proposal are summarised below. – Construction of the proposal will result in a temporary increase of greenhouse gas emissions as outlined in Appendix L. These temporary emissions are broken down as follows: – Scope 1 emissions: 2,328 tonnes CO2-e – There are no Scope 2 emissions associated with the project because there is no consumption of electricity from the WA state grid supply. – Scope 3 emissions: 713 tonnes CO2-e. – The total emissions from operation of the proposal over a 50-year period (the estimated life of the project) are estimated as 23,446 tonnes CO2-e. Thes equates to 469 tonnes CO2-e per annum from operation of the proposal. These emissions are broken down as follows: – Scope 1 emissions: 392 tonnes CO2-e per annum

Environmental factor	Objective	Relevance to the proposal
		– There are no Scope 2 emissions associated with the project because there is no consumption of electricity from the WA state grid supply – Scope 3 emissions: 77 tonnes CO2-e. • Based on the above emission estimates, the overall emissions from construction (3,041.51 CO2-e) and the annual emissions from operation (469.51 tonnes CO2-e) are below the EPAs trigger of 100,000 tonnes CO2-e of emissions in any year.
People		
Human health	To protect human health from significant harm	This factor primarily relates to projects where radiation occurs within materials in a manner that could pose a risk to human health. The proposal is not expected to present any human health risk.

14.2 Matters of national environmental significance

Under the EPBC Act, if a proposal involves an action that is likely to result in a significant impact on a MNES, the proposal must be referred to the DCCEEW. The DCCEEW defines a significant impact as an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts (Department of the Environment, 2013).

A desktop search of the PMST for MNES was undertaken on 14 September 2023 to identify any MNES with the potential to occur within 10 km of the proposal (Appendix R). A summary of the search results is provided in Table 23, identifying the number of matters returned and the relevance of the search results to the proposal.

As outlined in Table 23, the proposal has potential to impact listed threatened species and listed migratory species. The proposal has been assessed against the significant impact criteria for these MNES in the sections below.

14.2.1 Listed threatened species

14.2.1.1 Flora

The PMST search of the area within a 10 km radius of the proposal identified that the dwarf bee-orchid (*Diuris micrantha*) is recorded within the area. The dwarf bee-orchid is generally associated with Banksia woodlands and other vegetation communities that occur on the mainland. It is not associated with the vegetation units identified within the development envelope (Section 11.4.2 of this report) and is unlikely to occur within the development envelope.

The flora and vegetation surveys undertaken by RPS (2024) and Focused Vision Consulting (FVC) (2023) did not identify any conservation significant flora species within the development envelope.

As the dwarf bee-orchid does not occur within the development envelope, significant impacts as a result of the proposal are highly unlikely.

14.2.1.2 Fauna

The PMST search identified 43 threatened fauna species within a 10 km radius of the development envelope. Results of the search are provided in Appendix R and Table 23.

14.2.1.2.1 Terrestrial fauna species

A likelihood of occurrence assessment was undertaken by EcoLogical (2024) as part of the fauna assessment. Fauna species listed under the EPBC Act that were considered likely to occur within the development envelope was the quokka.

14.2.1.2.1.1 Significant impact assessment

An assessment of the proposal against the significant impact criteria for the quokka (Vulnerable, EPBC Act) is provided in Table 79.

Table 79: Significant impact criteria – Listed threatened species (terrestrial fauna)

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
Lead to a long-term decrease in the size of a population	Construction of the terrestrial components of the proposal will result in removal of 0.46 ha of native vegetation providing potential habitat to the quokka. Vegetation clearing and habitat fragmentation have been identified as potential threats to the survival and recovery of quokka populations. Although the quokka populations present on Wadjemup / Rottnest Island are resilient to the current levels of disturbance (DCCEEW, 2024). Focused Vision Consulting undertook flora and vegetation surveys within the area shown in Figure 42. The vegetation surveyed by Focused Vision Consulting that was most analogous to the vegetation present within the development envelope comprised the vegetation units MIAp and MIGl with a combined area of 67.39 ha. As such, it has been assumed that there is approximately 67.39 ha of similar fauna habitat to the 0.46 ha being directly impacted within vicinity of the proposal. The direct impacts to 0.46 ha of potential fauna habitat comprises 0.68% of the larger area surveyed by Focused Vision Consulting. Wadjemup / Rottnest Island encompasses approximately 1,800 ha, most of which is vegetated. If a conservative estimate is adopted, with an assumption that half of the island remains vegetated, clearing 0.46 ha of vegetation comprising potential fauna habitat would comprise 0.05% of the vegetation present on the island. As the total loss of terrestrial fauna habitat resulting from the proposal is low in a regional context, the proposal is considered unlikely to lead to a long-term decrease in the size of a population.	**Not at variance** The proposal will not lead to a long-term decrease in the size of the quokka population.
Reduce the area of occupancy of the species	As discussed above, direct impacts to 0.46 ha of potential fauna habitat comprises 0.68% of that present in the surrounding area surveyed by Focused Vision Consulting. As the total loss of terrestrial fauna habitat resulting from the proposal is low in a regional context, the proposal is considered unlikely to reduce the area of occupancy of the quokka. Furthermore, none of the vegetation within the development envelope was considered to have a limited local extent or distribution (Focused Vision, 2023) and is not considered to comprise habitat critical to the survival of the quokka or any other terrestrial species.	**Not at variance** The proposal will not lead to reduction in the area of occupancy of the quokka.
Fragment an existing population into two or more populations	The terrestrial component of the development envelope comprises the existing Army Jetty Road. Consequently, the proposal will not result in further fragmentation of an existing population into two or more populations.	**Not at variance** The proposal will not result in the fragmentation of an existing quokka population into two or more populations.
Adversely affect habitat critical to the survival of a species	None of the vegetation within the development envelope was considered to have a limited local extent or distribution (Focused Vision, 2023) and is not considered to comprise habitat critical to the survival of the quokka or any other terrestrial species. Clearing 0.46 ha of potential habitat will not adversely affect habitat critical to the survival of the quokka.	**Not at variance** The proposal will not adversely affect habitat critical to the survival of the quokka.
Disrupt the breeding cycle of a population	The vegetation within the development envelope is not considered to comprise habitat critical for the quokka. Clearing 0.46 ha of this vegetation will not disrupt the breeding cycle of the population.	**Not at variance** The proposal will not disrupt the breeding cycle of the quokka.

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The proposal will result in clearing 0.46 ha of potential habitat within the development envelope. Focused Vision Consulting (2023) identified 67.39 ha of habitat similar to that present within the development envelope in the Focused Vision Consulting survey area (Figure 42). Consequently, direct impacts to 0.46 ha of potential fauna habitat comprises 0.68% of the larger area surveyed by Focused Vision Consulting and is unlikely to result in a decrease in the availability or quality of habitat to the extent that the species is likely to decline.	**Not at variance** The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the vulnerable species' habitat.	The CEMP details hygiene protocols to ensure the proposal does not result in the introduction of an invasive species during construction.	**Not at variance** Implementation of the CEMP and OEMP will ensure that the proposal will not result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
Introduce disease that may cause the species to decline	The CEMP details hygiene protocols and will ensure no diseases are introduced to the proposal area as a result of the proposal.	**Not at variance** Implementation of the CEMP and OEMP will ensure that the proposal will not introduce disease that may cause the species to decline.
Interfere with the recovery of the species	The vegetation within the development envelope is not considered to comprise habitat critical for the quokka. Clearing 0.46 ha of this vegetation will not interfere with the recovery of the quokka.	**Not at variance** The proposal is unlikely to interfere with the recovery of the quokka.

14.2.1.2.2 Marine fauna species

Based on the database searches and literature review undertaken to support the proposal (Appendix B), the listed threatened marine fauna species listed in Table 80 may occur within South Thomson Bay (RPS, 2024a).

Table 80: Listed threatened marine fauna species (RPS, 2024a)

Name		Conservation status		Distribution at Wadjemup/ Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	Common	EPBC Act	BC Act		
Sharks					
Sphyrna lewini	Scalloped hammerhead	Conservation Dependent	Not included	Species or species habitat likely to occur within area	Undertake annual foraging and breeding migrations. Known to aggregate in the Shoalwater islands Marine Park, where peak numbers are observed during January and February (López, 2023).
Carcharias taurus (west coast population)	Grey nurse shark (west coast population)	Vulnerable	Vulnerable	Congregation or aggregation known to occur within area	Year-round presence. Seasonal migration patterns have not been observed (DCCEEW, 2023b).
Carcharodon carcharias	White shark	Vulnerable, Migratory	Vulnerable	Species or species habitat known to occur within area	Have been shown to undertake migrations north along the WA coast during spring and return in summer; however, coastal movements are not synchronous. They are frequently recorded in waters around fur seal and sea lion colonies, including in the Perth region (DCCEEW, 2023b), where they are more likely to be present during spring and early summer and least likely to be present during late summer and autumn (SharkSmart, 2018).
Mammals					
Neophoca cinerea	Australian sea lion	Endangered	Endangered	Species or species habitat likely to occur within area. The development footprint is located within the foraging BIA for this species.	Has an asynchronous non-annual breeding cycle with cycles ranging from 16 to 20 months and pupping occurring at different times throughout the South-West Marine Region (DCCEEW, 2023b).
Eubalaena australis	Southern right whale	Endangered, Migratory	Vulnerable	The development footprint is located within the migratory BIA for this species†	Southern temperate to subpolar waters including marine areas of southern Australia from May to October. The migratory period within the migration BIA up the west coast of WA is April to October (National Conservation Values Atlas, 2023).
Balaenoptera musculus brevicauda	Pygmy blue whale	Endangered	Endangered (as *Balaenoptera musculus)*	Known to occur in the area. The development footprint is located within the distribution BIA for this species.	The northbound migration past Perth Canyon occurs between April and July (peak May to June), with the return migration from October to January (peak November to early December.
Reptiles					
Caretta caretta	Loggerhead turtle	Endangered, Migratory	Endangered	Foraging, feeding or related behaviour known to occur within area	Generally nesting in summer at nesting grounds in northern WA (not necessarily every year; ALA, 2023).
Dermochelys coriacea	Leatherback turtle	Endangered, Migratory	Vulnerable	Species or species habitat known to occur within area	Migrates from foraging areas to nesting beaches in tropical and subtropical regions during summer (ALA, 2023; DCCEEW, 2023b).
Chelonia mydas	Green turtle	Vulnerable, Migratory	Vulnerable	Foraging, feeding or related behaviour known to occur within area	Migrates from foraging areas to nesting beaches in tropical regions during summer, typically between November and March (DCCEEW, 2023b).
Birds					
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered	Critically Endangered	Species or species habitat known to occur within area	The northern Siberian bar-tailed godwit occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (TSCC, 2016).
Calidris tenuirostris	Great knot	Critically Endangered	Critically Endangered	Roosting known to occur within area	The great knot has been recorded around the entirety of the Australian coast and is common on the coasts of the Pilbara and Kimberley, from the Dampier Archipelago to the Northern Territory border. Great knots prefer sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons (DCCEEW, 2023).
Calidris ferruginea	Curlew sandpiper	Critically Endangered	Critically Endangered	Species or species habitat known to occur within area	In Western Australia, the curlew sandpiper is widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division. They mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons.
Numenius madagascariensis	Eastern curlew	Critically Endangered	Critically Endangered	Species or species habitat likely to occur within area	The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Cornel University 2023).
Charadrius mongolus	Lesser sand plover	Endangered	Endangered	Roosting known to occur within area	The lesser plover mainly occurs in northern and eastern Australia, rare in south-western Australia. The species is almost strictly coastal, preferring sandy beaches, mudflats of coastal bays and estuaries, sand flats and dunes near the coast (Cornell University, 2023).
Calidris canutus	Red knot	Endangered	Endangered	Species or species habitat known to occur within area	The red knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms (Higgins, 1996)
Rostratula australis	Australian painted snipe	Endangered	Endangered	Species or species habitat may occur within area	The Australian painted snipe lives in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh (TSSC, 2013)
Charadrius leschenaultii	Greater sand plover	Vulnerable	Vulnerable	Species or species habitat known to occur within area	Mainly occurs on sheltered sandy, shelly or muddy beaches, large intertidal mudflats, sandbanks, salt marshes, estuaries, coral reefs, rocky islands rock platforms, tidal lagoons and dunes near the coast (Cornel University 2023).
Sternula nereis nereis	Australian fairy tern	Vulnerable	Vulnerable	Foraging, feeding or related behaviour known to occur within area. Migrant breeding, breeding habitat present within the area.	In south-western Australia, the fairy tern breeds between October and March with peak breeding between December and January. The Natural Jetty at the end of Philip Point is an important roost site for fairy terns.

*As listed in the PMST search results and/or Atlas of Living Australia (ala.org.au)

†Although the PMST search indicates that breeding by *E. australis* may occur within the PMST search area, a review of the online National Conservation Values Atlas indicates that this is not the case and only the migration BIA for the species overlaps Thomson Bay

Definitions: BC Act = *Biodiversity Conservation Act 2016* (WA), BIA = Biologically Important Area, DBCA = Department of Biodiversity, Conservation and Attractions (WA), EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Priority 4 = Rare, Near Threatened and other species in need of monitoring (BC Act)

Other Specially Protected = Species otherwise in need of special protection (BC Act)

14.2.1.2.2.1 Significant impact assessment

An assessment of the potential impacts to these species from implementation of the proposal against the significant impact criteria in Table 81.

Table 81: Significant impact criteria – Listed threatened species (marine fauna)

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
Lead to a long-term decrease in the size of a population	The proposal will result in the following potential impacts to listed threatened marine fauna species: • Predicted loss of 3.32 ha of habitat for marine fauna, which includes: – 2.06 ha mixed seagrass – 1.26 ha sand with wrack. • Reduction in marine environmental quality. The area affected by suspended sediments during dredging and construction will be limited to the modelled zones of impact. Silt curtains will be used for dredging and rock-dumping for breakwater construction, thereby limiting the impact from increased suspended sediments and minimising the indirect impact to marine fauna behaviours and potential habitat. With implementation of the CEMP, DEMP and OEMP, residual impacts to marine fauna from changes to marine environmental quality are considered low. • Underwater noise emissions from piling operations causing temporary disturbance to marine fauna species. The potential for these impacts to result in a long-term decrease in the size of a population of a listed threatened marine fauna species is discussed below. **Shark species** Three threatened shark species may occur within vicinity of the proposal. Scalloped hammerheads (EPBC Act listed conservation dependent) and white sharks (vulnerable) are typically seasonal and use the area for foraging and/or migration; however, may be present year-round. Scalloped hammerheads aggregate in the Shoalwater Islands Marine Park (approximately 30 km from the proposal), peaking during January and February. White sharks are more likely to be present in the Perth region during spring and early summer, and least likely to be present during late summer and autumn. The grey nurse shark (vulnerable) is known to congregate or aggregate in the area year-round. These shark species are known to utilise the following habitat types: • Grey nurse sharks (western population) are found in inshore waters, particularly sub-tropical to temperate waters. Grey nurse sharks are often observed aggregating around inshore rocky reefs or islands (Department of the Environment, 2014). There is likely to be habitat suitable for this species around the island, however the development envelope is unlikely to provide significant habitat for this species. • The scalloped hammerhead is predominately found along coastal shelves, though will occasionally travel into intertidal zones and inshore habitats may be important for immature hammerheads (DCCEEW, 2024). • Great white sharks are frequently recorded in waters around fur seal and sea lion colonies such as those to the west end of the island. There is likely to be habitat suitable for this species around the island, however the development envelope is unlikely to provide significant habitat for this species. The benthic communities and habitats within the development envelope is unlikely to provide critical habitat for these shark species. However, the benthic communities and habitats is likely to provide habitat for prey species for the shark species. An assessment of the shark species pressure analysis for the South-west Marine Region indicates that most of the shark species addressed in the species report group card for sharks are not susceptible to the pressure of habitat modification (DSEWPC, 2012). As such the proposed dredging and removal of benthic communities and habitats is unlikely to have a significant impact on the shark species present in South Thomson Bay. As the proposal will only result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU), direct impacts to potential habitat for these species are unlikely to result in a long-term decrease in the size of a population. Indirect impacts to marine habitats and environmental quality will be managed and mitigated through implementation of the CEMP, DEMP and OEMP. Implementation of these plans will ensure that indirect impacts are limited to 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI are anticipated to recover within five years. As such, indirect impacts to potential habitat for these species is unlikely to result in a long-term decrease in the size of a population of the above shark species. **Marine mammals** Seasonal migration of listed threatened whale species along the WA coast includes the southern right whale (endangered; migration April to October), pygmy blue whale (endangered; migration April to January), and the minke whale (may be present over winter). Other listed marine mammals that may be present year-round includes the Australian sea lion (endangered). The development envelope is within the following BIAs for these species: • Australian sea lion (the development envelope is within the foraging BIA for this species) • Pygmy blue whale (the development envelope is within the distribution BIA for this species) • Southern right whale (the development envelope is within the migration BIA for this species). The development envelope is located within the foraging BIA for the Australian sea lion. The closest known haul out area for these species is on Carnac Island and there is potential that these species forage within the development envelope. As the proposal will only result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU), direct impacts to potential habitat for these species are unlikely to result in a long-term decrease in the size of a population. Construction of the proposal will not result in impacts that lead to a long-term decrease in the size of a whale population. Potential behavioural impacts to whale species during construction from underwater noise are discussed later in this table. The proposed development envelope is located within the coastal area of South Thomson Bay and the infrastructure is unlikely to impact the migratory pathways of the whale species. Barge movements may traverse the migration route, however as these barge movements are existing, no additional impacts from operation of the proposal are anticipated. Construction and operation of this proposal will not result in a long-term decrease in the size of a marine mammal population. **Turtles** The site is not within a BIA for any turtle species and there are no nesting or internesting areas identified as habitat critical to the survival of marine turtle species (DoEE, 2017). However, seagrass meadows do provide the following habitat for turtle species and as such, there is potential that the loggerhead turtle (endangered), leatherback turtle (endangered), and green turtle (vulnerable) may occasionally occur in the area (DoEE, 2017): • The green turtle forages on algae and seagrass. • Juvenile and adult sea turtle species are known to forage where there are seagrass meadows present. Turtles migrate to/from their nesting grounds in northern WA during summer (typically between November and March); however, their common distribution is north of the development envelope and these species are not anticipated to frequent the area. As the development envelope is not located within a BIA for turtle species does not comprise any significant or critical habitat for these species, the impacts listed above are unlikely to result in a long-term decrease in the size of a population of the above turtle species. **Marine bird species** Listed threatened marine bird species which are known to occur within vicinity of the development envelope includes the Australian fairy tern. Other marine bird species, in particular the Caspian tern and crested tern, may occasionally occur within vicinity of the proposal. However, as there is no critical or significant habitat (such as roosting or breeding sites) present within or proximate to the development envelope, significant impacts from the proposal are unlikely.	**Not at variance** The proposal will not lead to a long-term decrease in the size of a population of listed threatened marine fauna species.

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
	The Australian fairy tern is known to roost at the Natural Jetty at the end of Philip Point, approximately 900 m east of the proposal and may forage within the development envelope. Implementation of the proposal is unlikely to have significant direct impacts on the Australian fairy tern that would result in a long-term decrease in the size of the population. A coastal processes assessment has been undertaken to identify potential impacts of the proposal on coastal processes. This assessment identified that the proposal is unlikely to result in significant erosion of the roosting habitat present at Philip Point. Therefore, the proposal will not result in a long-term decrease in the size of this population.	
Reduce the area of occupancy of the species	**Shark species** There is potential for the three threatened shark species listed above to occur within South Thomson Bay. However, as discussed above, it is considered unlikely that the development envelope comprises critical habitat for these species. The proposal will result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass. As the predicted loss of seagrass is only 0.52% of the LAU, direct impacts to potential habitat for these species is unlikely to result in a long-term decrease in the size of a population. With implementation of the CEMP and OEMP, indirect impacts to habitat for these species is unlikely to be significant. **Marine mammals** There is potential for the southern right whale, pygmy blue whale and minke whale to occur within or within vicinity of the development envelope. The proposal will not significantly reduce the area of occupancy of the wide-ranging migratory whale species. There is potential for the Australia sea lion to forage within and adjacent to the development envelope. The proposal will result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass that may be used by the Australia sea lion. As the loss predicted loss of seagrass is only 0.52% of the LAU, direct impacts to potential habitat for these species is unlikely to result in a long-term decrease in the size of a population. Underwater noise from piling activities has the potential to result in avoidance behaviours, thereby reducing the area of occupancy of marine fauna species. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details). **Turtles** Turtle species that may forage in the area include the loggerhead turtle, leatherback turtle and green turtle. The development envelope is not within a BIA for these turtle species and their common distribution is north of the development envelope. Therefore, the proposal is unlikely to reduce the area of occupancy of these species. Underwater noise from piling activities has the potential to result in avoidance behaviours, thereby reducing the area of occupancy of marine fauna species. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details). **Marine bird species** Listed threatened marine bird species that are known to occur within vicinity of the development envelope includes the Australian fairy tern. Other marine bird species may occasionally occur within vicinity of the development, however, are unlikely to be impacted by the proposal. The Australian fairy tern is known to roost at the Natural Jetty at the end of Philip Point, approximately 900 m east of the proposal and may forage within the development envelope. Implementation of the proposal is unlikely to have significant direct impacts on the area of occupancy of this species. A coastal processes assessment has been undertaken to identify potential impacts of the proposal on coastal processes. This assessment identified that the proposal is unlikely to result in significant erosion of the roosting habitat present at Philip Point. Therefore, the proposal will not result in a decrease in the area of occupancy of this species.	**Not at variance** The proposal will not lead to reduction in the area of occupancy of any listed threatened marine fauna species.
Fragment an existing population into two or more populations	The existing Army Groyne encompasses 2,527 m^2 and the proposed breakwater that will be constructed over the existing groyne, encompasses 4,357 m^2. The proposed breakwater extends approximately 130 m from the shoreline. Due to the small scale of the proposal and the fact that it is being constructed over an existing structure, the proposal does not result in a significant increase in barriers to marine fauna movements within the bay. Furthermore, the development envelope comprises a small part of the larger South Thomson Bay area that is the broader ecosystem, which may be used by marine fauna species. Therefore, it is not considered likely for the proposal to result in fragmentation of the local population of any protected marine fauna.	**Not at variance** The proposal will not result in the fragmentation of an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	The development envelope is within the BIA of the following threatened marine fauna species: • Fairy tern (the development envelope is within the foraging BIA for this species) • Australian sea lion (the development envelope is within the foraging BIA for this species) • Pygmy blue whale (the development envelope is within the distribution BIA for this species) • Southern right whale (the development envelope is within the migration BIA for this species). Loss of benthic habitats due to construction of the proposal may impact foraging habitat of the Australian fairy tern and Australian sea lion. However, as the proposal will result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU), direct impacts to potential foraging habitat for these species is not considered significant. Construction of the proposal is unlikely to adversely impact critical habitat to the wide-ranging migratory whale species which may occur in the area. Implementation of the CEMP and OEMP will ensure indirect impacts to habitat for these species is unlikely to be significant.	**Not at variance** The proposal will not adversely affect habitat critical to the survival of a species
Disrupt the breeding cycle of a population	The development envelope is not within a breeding BIA for any threatened marine species and is not known to provide critical breeding habitat for these species. Loss of 2.06 ha of seagrass (0.52% of the LAU) is not considered likely to disrupt the breeding cycle of a population. Underwater noise from piling activities has the potential to result in injury and changes in behaviours of marine fauna species. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details).	**Not at variance** The proposal will not disrupt the breeding cycle of a population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will result in the permanent loss of 2.06 ha of seagrass. This loss of seagrass comprises 0.52% of the LAU. As the proposal will not result in the loss of significant amounts of benthic communities and habitats when compared to that present in the larger area, nor result in a significant increase of barriers to free movement of marine fauna, the proposal is not considered likely to result in the decline of a threatened marine species.	**Not at variance** The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The proposal will result in the relocation of existing barge movements from the Main Jetty to the development envelope. As no new activities are proposed during operation of the proposal, the introduction of IMS is unlikely. There is potential for the introduction of IMS during construction of the proposal. Measures outlined in the CEMP and DEMMP will ensure that the risk for the introduction of IMS is low.	**Not at variance** Implementation of the CEMP and OEMP will ensure that the proposal will not result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
Introduce disease that may cause the species to decline	Ballast water is a recognised potential vector for introduction of disease organisms in the marine environment. However, as indicated above, no new marine activities are proposed during operation and construction activities will be management in accordance with the CEMP.	**Not at variance** Implementation of the CEMP and OEMP will ensure that the proposal will not introduce

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
		disease that may cause the species to decline.
Interfere with the recovery of the species	Due to the small scale of the direct impacts anticipated from the proposal and the mitigations and management measures outlined in the CEMP and OEMP to minimise the risk of disturbance from spills and underwater noise, the proposal is unlikely to interfere with the recovery of any threatened marine species.	**Not at variance** The proposal is unlikely to interfere with the recovery of any threatened marine species.

14.2.2 Migratory species

Based on the database searches and desktop marine fauna assessment to support the proposal (Appendix B), the migratory species listed in Table 82 may occur within South Thomson Bay (RPS, 2024a).

Table 82: Migratory species

Name		Conservation status		Distribution at Wadjemup / Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	Common	EPBC Act	BC Act		
Sharks					
Carcharodon carcharias	White shark	Vulnerable, Migratory	Vulnerable	Species or species habitat known to occur within area	Have been shown to undertake migrations north along the WA coast during spring and return in summer; however, coastal movements are not synchronous. They are frequently recorded in waters around fur seal and sea lion colonies, including in the Perth region (DCCEEW, 2023b), where they are more likely to be present during spring and early summer and least likely to be present during late summer and autumn (SharkSmart, 2018).
Mammals					
Eubalaena australis	Southern right whale	Endangered, Migratory	Vulnerable	The development footprint is located within the migratory BIA for this species†	Southern temperate to subpolar waters including marine areas of southern Australia from May to October. The migratory period within the migration BIA up the west coast of WA is April to October (National Conservation Values Atlas, 2023).
Megaptera novaeangliae	Humpback whale	Migratory	Conservation Dependent, Migratory	Species or species habitat known to occur within area. The development footprint is located within the migratory BIA for this species.	The annual peak northbound migration along the Jurien Bay to Carnarvon migration route occurs between June and July, while the southbound migration peak occurs between September and October (DCCEEW, 2023b).
Orcinus orca	Killer whale, Orca	Migratory	Migratory	Species or species habitat may occur within area	Mating is known to occur all year round, whilst the calving season spans several months. However, no areas of significance and no determined migration routes have been identified for this species within waters off WA (DCCEEW, 2023b). They are typically present on the south coast of WA between January to April.
Balaenoptera musculus brevicauda	Pygmy blue whale	Endangered Migratory		Known to occur in the area. The development envelope is located within the distribution BIA for this species.	The northbound migration past Perth Canyon occurs between April and July (peak May to June), with the return migration from October to January (peak November to early December).
Reptiles					
Caretta caretta	Loggerhead turtle	Endangered, Migratory	Endangered	Foraging, feeding or related behaviour known to occur within area	Generally nesting in summer at nesting grounds in northern WA (not necessarily every year; ALA, 2023).
Dermochelys coriacea	Leatherback turtle	Endangered, Migratory	Vulnerable	Species or species habitat known to occur within area	Migrates from foraging areas to nesting beaches in tropical and subtropical regions during summer (ALA, 2023; DCCEEW, 2023b).
Chelonia mydas	Green turtle	Vulnerable, Migratory	Vulnerable	Foraging, feeding or related behaviour known to occur within area	Migrates from foraging areas to nesting beaches in tropical regions during summer, typically between November and March (DCCEEW, 2023b).
Birds					
Limosa lapponica menzbieri	Northern Siberian bar-tailed godwit	Critically Endangered Migratory	Critically Endangered	Species or species habitat known to occur within area	The northern Siberian bar-tailed godwit occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (TSCC, 2016).
Calidris tenuirostris	Great knot	Critically Endangered Migratory	Critically Endangered	Roosting known to occur within area	The great knot has been recorded around the entirety of the Australian coast and is common on the coasts of the Pilbara and Kimberley, from the Dampier Archipelago to the Northern Territory border. Great knots prefer sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. (DCCEEW, 2023).
Calidris ferruginea	Curlew sandpiper	Critically Endangered Migratory	Critically Endangered	Species or species habitat known to occur within area	In Western Australia, the curlew sandpiper is widespread around coastal and subcoastal plains from Cape Arid to south-west Kimberley Division. They mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons.
Numenius madagascariensis	Eastern curlew	Critically Endangered Migratory	Critically Endangered	Species or species habitat likely to occur within area	The eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Cornel University 2023).
Charadrius mongolus	Lesser sand plover	Endangered Migratory	Endangered	Roosting known to occur within area	The lesser plover mainly occurs in northern and eastern Australia, rare in south-western Australia. The species is almost strictly coastal, preferring sandy beaches, mudflats of coastal bays and estuaries, sand flats and dunes near the coast (Cornell University, 2023).
Calidris canutus	Red knot	Endangered Migratory	Endangered	Species or species habitat known to occur within area	The red knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms (Higgins, 1996)
Charadrius leschenaultii	Greater sand plover	Vulnerable Migratory	Vulnerable	Species or species habitat known to occur within area	Mainly occurs on sheltered sandy, shelly or muddy beaches, large intertidal mudflats, sandbanks, salt marshes, estuaries, coral reefs, rocky islands rock platforms, tidal lagoons and dunes near the coast (Cornel University 2023).
Sternula nereis nereis	Australian fairy tern	Vulnerable Migratory	Vulnerable	Foraging, feeding or related behaviour known to occur within area. Migrant breeding, breeding habitat present within the area.	In south-western Australia, the fairy tern breeds between October and March with peak breeding between December and January. The Natural Jetty at the end of Philip Point is an important roost site for fairy terns.
Ardenna pacifica	Wedge-tailed shearwater	Marine Migratory		Breeding known to occur within area.	The wedge tailed shearwater is known to breed in burrows on Wadjemup/Rottnest Island between August to May (DCCEEW, 2023). Significant breeding habitat for this species is located on the west end of the island, such as on Cape Vlamingh, and impacts to this species or its habitat are unlikely as a result of the proposal.
Onychoprion anaethetus	Bridled tern	Marine Migratory		Breeding known to occur within area.	The bridled tern is a common visitor to Rottnest to breed (Rottnest Island Authority, 2019). It forms small colonies and nests on the ground usually in areas sheltered by plants, ledges or caves. There are no known breeding colonies within the vicinity of the proposal and due to the high level of disturbances from recreational users at

Name		Conservation status		Distribution at Wadjemup / Rottnest Island and surrounding waters*	Habitat and seasonal preferences
Species	Common	EPBC Act	BC Act		
					Thomson Bay, there are unlikely to be any significant roosting sites within vicinity of the proposal. Consequently, impacts as a result of the proposal are unlikely.
Hydroprogne caspia	Caspian tern	Marine Migratory		Breeding known to occur within area.	The proposal is located within the foraging BIA for the Caspian tern and a small number of Caspian terns roost at Natural Jetty. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely.
Thalasseus bergii	Crested tern	Marine Migratory		Breeding known to occur within area.	The crested tern is the most common tern on the island, with the main nesting colonies located on Lake Baghdad and Herschel Lake (Rottnest Island Authority, 2019b). The crested tern may roost at the Natural Jetty. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely.
Sterna dougallii	Roseate tern	Marine Migratory		Breeding known to occur within area.	The proposal is located within the foraging BIA for the roseate tern. As there are no known breeding colonies or roosting habitat for this species within the development envelope, significant direct impacts are unlikely. However, as roseate terns roost at Natural Jetty, potential indirect impacts to this species have been considered.

*As listed in the PMST search results and/or Atlas of Living Australia (ala.org.au)

† Although the PMST search indicates that breeding by *E. australis* may occur within the PMST search area, a review of the online National Conservation Values Atlas indicates that this is not the case and only the migration BIA for the species overlaps Thomson Bay

Definitions: BC Act = *Biodiversity Conservation Act 2016* (WA), BIA = Biologically Important Area, DBCA = Department of Biodiversity, Conservation and Attractions (WA), EPBC Act = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Priority 4 = Rare, Near Threatened and other species in need of monitoring (BC Act)

Other Specially Protected = Species otherwise in need of special protection (BC Act)

14.2.2.1 Significant impact assessment

Assessment of the proposal against the significant impact criteria for listed migratory species is provided in Table 83.

Table 83: Significant impact criteria - Migratory species

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	**Migratory bird species** The development envelope is within the foraging BIA of a number of migratory bird species. Of these, the wedgetail shearwater, roseate tern, crested tern, Caspian tern, Australian fairy tern and bridled tern are considered likely to forage within the development envelope. Other migratory bird species may occasionally occur within vicinity of the development envelope, however, are unlikely to be impacted by the proposal. As the proposal will only result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU). Direct impacts to the foraging potential within the development envelope is unlikely to be significant. Potential habitat for these species is unlikely to result in a long-term decrease in the size of a population. A number of the tern species are known to roost at the Natural Jetty at the end of Philip Point, approximately 900 m east of the proposal and may forage within the development envelope. A coastal processes assessment has been undertaken to identify potential impacts of the proposal on coastal processes. This assessment identified that the proposal is unlikely to result in significant erosion of the roosting habitat present at Philip Point. Therefore, the proposal will not result in a significant modification of this roosting habitat. **Shark species** Three threatened shark species may occur within vicinity of the proposal. Scalloped hammerheads (EPBC Act listed conservation dependent) and white sharks (vulnerable) are typically seasonal and use the area for foraging and/or migration; however, may be present year-round. Scalloped hammerheads aggregate in the Shoalwater Islands Marine Park (approximately 30 km from the proposal), peaking during January and February. White sharks are more likely to be present in the Perth region during spring and early summer, and least likely to be present during late summer and autumn. The grey nurse shark (vulnerable) is known to congregate or aggregate in the area year-round. These shark species are known to utilise the following habitat types: • Grey nurse sharks (western population) are found in inshore waters, particularly sub-tropical to temperate waters. Grey nurse sharks are often observed aggregating around inshore rocky reefs or islands (Department of the Environment, 2014). There is likely to be habitat suitable for this species around the island, however the development envelope is unlikely to provide significant habitat for this species. • The scalloped hammerhead is predominately found along coastal shelves, though will occasionally travel into intertidal zones and inshore habitats may be important for immature hammerheads (DCCEEW, 2024). • Great white sharks are frequently recorded in waters around fur seal and sea lion colonies such as those to the west end of the island. There is likely to be habitat suitable for this species around the island, however the development envelope is unlikely to provide significant habitat for this species. The benthic communities and habitats within the development envelope is unlikely to provide critical habitat for these shark species. However, the benthic communities and habitats is likely to provide habitat for prey species for the shark species. An assessment of the shark species pressure analysis for the South-west Marine Region indicates that most of the shark species addressed in the species report group card for sharks are not susceptible to the pressure of habitat modification (DSEWPC, 2012). As such the proposed dredging and removal of benthic communities and habitats is unlikely to have a significant impact on the shark species present in South Thomson Bay. As the proposal will only result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU), direct impacts to potential habitat for these species are unlikely to result in a long-term decrease in the size of a population. Indirect impacts to marine habitats and environmental quality will be managed and mitigated through implementation of the CEMP, DEMP and OEMP. Implementation of these plans will ensure that indirect impacts are limited to 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. It is predicted that benthic communities and habitats that are impacted within the ZoMI are anticipated to recover within five years. As such, indirect impacts to potential habitat for these species is unlikely to result in a long-term decrease in the size of a population of the above shark species. **Marine mammals** Seasonal migration whale species along the WA coast includes the southern right whale, pygmy blue whale, humpback whale and orca. Construction and implementation of the proposal will not result in the significant modification, destruction or isolation of important habitat for these species. Underwater noise from piling activities has the potential to result in avoidance behaviours, thereby reducing the area of occupancy of marine fauna species. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details). **Turtles**	**Not at variance** The proposal will not substantially modify, destroy or isolate an area of important habitat for a migratory species.

Significant impact guidelines	Summary of impacts on MNES	Variance to guidelines
	Turtle species that may forage in the area include the loggerhead turtle, leatherback turtle and green turtle. The development envelope is not within a BIA for these turtle species and their common distribution is north of the development envelope. Therefore, the proposal is unlikely to reduce the area of occupancy of these species. Underwater noise from piling activities has the potential to result in avoidance behaviours, thereby reducing the area of occupancy of marine fauna species. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details).	
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The proposal will result in the relocation of existing barge movements from the Main Jetty to the development envelope. As no new activities are proposed during operation of the proposal, the introduction of IMS is unlikely. There is potential for the introduction of IMS during construction of the proposal. Measures outlined in the CEMP will ensure that the risk for the introduction of IMS is low.	**Not at variance** Implementation of the CEMP and OEMP will ensure that the proposal will not result in invasive species that are harmful to a migratory species becoming established in an area of important habitat for the migratory species.
Seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	**Migratory bird species** The development envelope is within the foraging BIA of a number of migratory bird species. Of these, the wedgetail shearwater, roseate tern, crested tern, Caspian tern, Australian fairy tern and bridled tern are considered likely to forage within the development envelope. These tern species are also known to roost at the Natural Jetty at the end of Philip Point, approximately 900 m east of the proposal. There is no important breeding habitat for these species within the development envelope. As the proposal will only result in the removal of 3.32 ha of benthic communities and habitats, including 2.06 ha of seagrass (0.52% of the LAU). Direct impacts to the foraging potential within the development envelope is unlikely to be significant and will therefore not seriously disrupt the life cycle of an ecologically significant proportion of these populations. A coastal processes assessment has been undertaken to identify potential impacts of the proposal on coastal processes. This assessment identified that the proposal is unlikely to result in significant erosion of the roosting habitat present at Philip Point. Therefore, the proposal will not result in a significant modification of this roosting habitat. **Shark species** There is no habitat important to the breeding, feeding, migration or resting behaviours of the white shark within the development envelope and the proposal is considered unlikely to seriously disrupt the life cycle of this species. **Marine mammals** The proposed development envelope is located within the shallower waters of the coastal area of South Thomson Bay and the proposed infrastructure is unlikely to extend into the migratory pathways of the whale species. As such, the proposed infrastructure will not disrupt any existing migratory pathways. Barge movements may traverse the migration route, however as these barge movements are existing, no additional impacts from operation of the proposal are anticipated. Therefore, construction and implementation of the proposal will not significantly impact the migratory pathways of these species. Underwater noise from piling activities has the potential to result in injury or changes in behaviour of marine fauna. Implementation of the CEMP (Emerge, 2025a) (Appendix P) and DEMMP (02 Environment, 2025) (Appendix O) provides the monitoring and management framework to address potential impacts to marine fauna during construction. Implementation of the measures outlined in these management plans will ensure there are no significant residual impacts to marine fauna from underwater noise (see Section 10.6 for further details). **Turtles** Turtle species that may forage in the area include the loggerhead turtle, leatherback turtle and green turtle. The development envelope is not within a BIA for these turtle species and their common distribution is north of the development envelope. Therefore, the proposal is unlikely to seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of a marine turtle population.	**Not at variance** The proposal will not seriously disrupt the life cycle of an ecologically significant proportion of the population of a migratory species.

14.3 Other Commonwealth obligations under the EPBC Act

14.3.1 Critical habitat

There is no critical habitat to the survival of a species within the range of predicted impacts from the proposal.

14.3.2 Recovery and threat abatement plans

The applicable Recovery and Threat Abatement Plans and their objectives relevant to the proposal are provided in Table 84.

Table 84: Compliance with recovery and threat abatement plans

Plan	Objectives relevant to proposal	Compliance
Conservation Management Plan for the Southern Right Whale (DSEWPC, 2012)	• Assessing and addressing the threat of anthropogenic noise on southern right whale. • Addressing infrastructure and coastal development impacts.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Conservation Management Plan for the Southern Right Whale.
Conservation Management Plan for the Blue Whale (DoE, 2015)	Anthropogenic noise in biologically important areas will be managed such that any blue whale continues to utilise the area without injury and is not displaced from the foraging area.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Conservation Management Plan for the Blue Whale.
Recovery Plan for the Australian Sea Lion (*Neophoca cinerea*) (DSEWPC, 2013)	• Mitigate the impacts of marine debris on Australian sea lion populations. • Investigate and mitigate other potential threats to Australian sea lion populations, including disease, vessel strike, pollution and tourism.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Recovery Plan for the Australian Sea Lion.
National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (DAWE, 2022)	• Manage and protect known Australian fairy tern breeding populations at the landscape scale • Reduce, or eliminate threats at breeding, non-breeding and foraging sites	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Recovery Plan for the Australian Fairy Tern.
Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (DoEE, 2018)	Mitigate the impacts of harmful marine debris on marine species	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Threat abatement plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans.
Quokka (*Setonix brachyurus*) Recovery Plan (DEC, 2013)	The overall long-term objective of the recovery program is to at least maintain their current distribution and abundance.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Recovery Plan for the Quokka.

14.3.3 Wildlife Conservation Plans

The applicable Wildlife Conservation Plans and their objectives relevant to the proposal are discussed in Table 85.

Table 85: Wildlife Conservation Plans

Wildlife Conservation Plan	Objectives relevant to this report	Compliance
Wildlife Conservation Plan for Migratory Shorebirds (2015, 2015)	• Protection of important habitats for migratory shorebirds has occurred throughout the East Asian-Australasian Flyway. • Anthropogenic threats to migratory shorebirds in Australia are minimised or, where possible, eliminated.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Wildlife Conservation Plan for Migratory Shorebirds.
Wildlife Conservation Plan for Seabirds (DAWE, 2022)	• Seabirds and their habitats are identified, protected and managed in Australia. • The long-term survival of seabirds and their habitats is achieved through supporting priority research programs, coordinated monitoring, on-ground management and conservation. • Manage the effects of anthropogenic disturbance to seabird breeding and roosting areas.	Implementation of the CEMP and OEMP ensures that the proposal is not inconsistent with the Wildlife Conservation Plan for Seabirds.

14.3.4 Offshore dredge disposal

No offshore dredge disposal will be undertaken as part of the proposal, with all dredged material used for reclamation purposes within state waters. Activities that include the placement of matter for a purpose other than the disposal of material are not regulated under the *Environment Protection (Sea Dumping) Act 1981*.

Liaison with the Wildlife, Waste and Environmental Permits Branch of DCCEEW confirms that the utilisation of dredge material for land reclamation is considered placement for a purpose and therefore, does not require a sea dumping permit.

Should offshore disposal be required as part of maintenance dredging activities, application for a sea dumping permit will be made.

15 OFFSETS

The following policy and guidance have been reviewed as part of this assessment:

- WA Environmental Offsets Policy (Government of Western Australia, 2011)
- WA Environmental Offsets Guidelines (Government of Western Australia , 2014)
- EPBC Act environmental offsets policy (DSEWPC, 2012)
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual (EPA, 2020b).

Consistent with Principle 1 of the WA Environmental Offsets Policy (Government of Western Australia 2011) Rottnest Island Authority has applied the mitigation hierarchy by identifying measures to avoid and minimise environmental impacts, as outlined in Sections 7 to 13 this report.

As discussed in Section 16, the environmental impacts from the proposal as a whole includes:

- Impacts to benthic communities and habitats and marine fauna habitats:
  - Permanent loss of mixed seagrass of up to 2.06 ha (or 0.52% of mixed seagrass within the LAU)
  - Permanent loss of sand / sand with wrack of up to 1.26 ha
  - Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2025b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities
- Interruption to longshore currents may result in minor sediment accretion and seagrass accumulating on the eastern side of the wharf
- Temporary suspended sediments within the ZoMI (4.5 ha) and ZoI (13.44 ha)
- Temporary reduction in light due to suspended sediments in the water column within the ZoMI (4.5 ha). As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, these residual impacts are not considered significant
- Underwater noise emissions from piling operations causing temporary disturbance to marine fauna species
- Removal of 0.46 ha of native vegetation and potential fauna habitat. Of the native vegetation being cleared, 0.23 ha comprises the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.

As the assessment of these residual impacts concluded that they are not significant, no environmental offsets are proposed as art of this proposal.

16 HOLISTIC IMPACT ASSESSMENT

This report provides an assessment of the potential environmental impacts associated with the proposal and the proposed mitigation measures and management strategies for each key environmental factor. This section provides an assessment of the connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole.

RPS acknowledges the relationships between the key environmental factors addressed in this report and that those interrelationships may require synergistic consideration and management to achieve the proposed environmental outcomes. The key environmental factors that relate, to varying degrees, are demonstrated in Figure 56 and the combined impacts are summarised in Table 86.

Although social surroundings are only linked with coastal processes in this is assessment, due to the community perception and social values of Wadjemup / Rottnest Island, it is recognised that all key environmental factors are linked to social surroundings to a lesser degree.

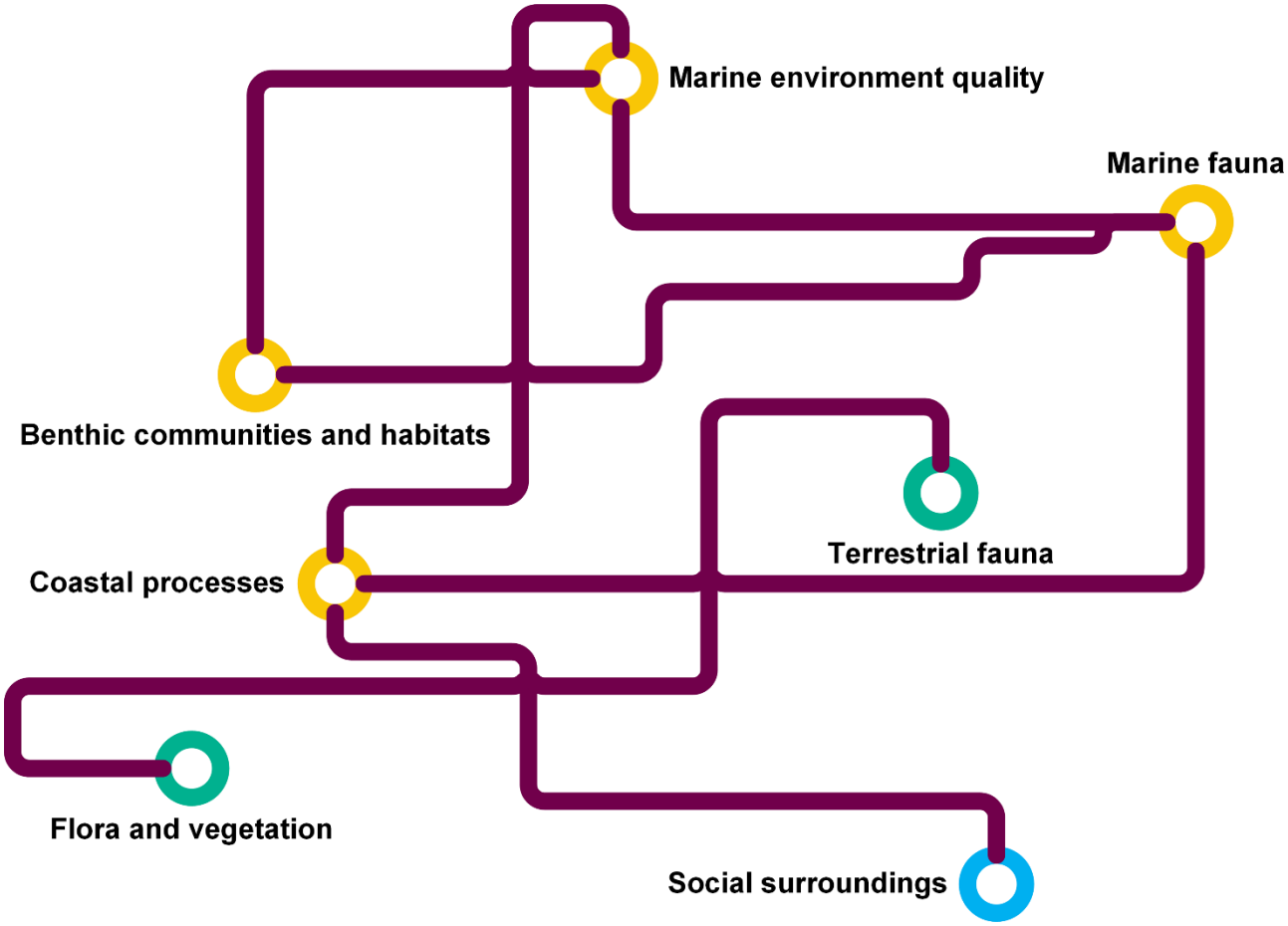


Figure 56: Relationship between key environmental factors

Table 86: Connections and interactions between key environmental factors relevant to the proposal

Environmental factor	Connection / interaction pathway	Combined impact
• Benthic communities and habitats • Marine environmental quality • Marine fauna • Coastal processes • Social surroundings	Construction of the proposal will result in a temporary increase in total suspended sediments.	• Reduced marine environmental quality • Decrease in light availability resulting from increased turbidity leading to reduced primary productivity. • Permanent and temporary (recoverable) loss benthic communities and habitat and marine fauna habitat. • Increased sedimentation rates, or burial, resulting in stress or increased mortality rates (under extreme conditions).
	Construction and operation of the proposal may result in the introduction of IMS	• Alteration of the natural benthic communities • Marine pests may threaten biodiversity through a number of mechanisms such as predation, competition for habitat and altering ecosystems.
	Impacts from marine infrastructure	• Altered water flows and sediment transport caused by the presence of new marine infrastructure potentially impacting marine bird roosting habitat. • Interruptions of longshore currents • Reduction of wave energy.
	Construction of the proposal may result in pollution incidents.	• Increased boat numbers during operation, and to lesser degree construction, of the proposal has the potential to increase the risk of pollution, including from antifouling paints, anti-corrosion anodes, increased risk of accidental discharges (e.g. fuel spills, oils and greases) and sullage. • A fuel facility, including underground storage tanks is proposed as part of the proposal. There is a risk for fuel spills to occur during refuelling or from fuel storage facilities. Fuel spills from the fuel facility have the potential to impact marine environmental quality.
	Construction and operation of the proposal.	• Impacts to amenity from noise, artificial lighting and odour.
• Flora and vegetation • Terrestrial fauna	Implementation of the proposal will result in clearing of native vegetation.	• Removal of native vegetation. • Loss of terrestrial fauna habitat.
	Implementation of the proposal will result in an increased risk of the spread or introduction of weeds and pests	• Degradation of native vegetation • Degradation of fauna habitat
	Implementation of the proposal will result in an increased risk of the spread or introduction of disease.	• Degradation of native vegetation • Degradation of fauna habitat

16.1 Residual impacts from the proposal as a whole

Overall, the residual impacts on these environmental factors are low due to the implementation of avoidance and mitigation measures.

The residual environmental impacts from the proposal as a whole include:

- Impacts to benthic communities and habitats and marine fauna habitats:
  - Permanent loss of mixed seagrass of up to 2.06 ha (or 0.52% of mixed seagrass within the LAU)
  - Permanent loss of sand / sand with wrack of up to 1.26 ha (including this as a residual impact is a conservative approach, as sand with wrack is likely to be present post dredging, resulting in only temporary unavailability of sand with wrack)
  - Temporary loss of 2.62 ha of mixed seagrass and 1.09 ha of sand / sand with wrack within the ZoMI. Baird (2025b) predicts that impacts to these benthic communities and habitats will be recoverable within a period of five years following completion of the dredging activities

- Interruption to longshore currents may result in minor sediment accretion and seagrass accumulating on the eastern side of the wharf
- A reduction of wave energy in lee of the wharf
- Temporary suspended sediments within the ZoHI (1.37 ha), ZoMI (4.5 ha) and ZoI (13.44 ha)
- Temporary reduction in light due to suspended sediments in the water column within the ZoMI (4.5 ha). As impacts to benthic communities and habitats within the ZoMI will be recoverable within a period of five years following completion of the dredging activities, these residual impacts are not considered significant
- Underwater noise emissions from construction activities such as piling operations and dredging causing temporary disturbance to marine fauna species
- Removal of 0.46 ha of native vegetation and potential fauna habitat. Of the native vegetation being cleared, 0.23 ha of vegetation that is analogous with the TEC, *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands of the Swan Coastal Plain.
- The permanent relocation of four moorings.

17 CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT

Cumulative environmental impacts are the successive, incremental and interactive impacts on the environment of a proposal with one or more past, present and reasonably foreseeable future activities. RPS has undertaken a cumulative impact assessment that considers impacts to environmental factors relevant to the proposal from previous, current, and potential future projects that have been approved within 5 km of the proposal.

Cumulative impacts to benthic communities and habitats are discussed in Section 7.5.1.1.3 of this report. A summary of the predicted cumulative impacts to benthic communities and habitats is summarised below:

- Conservative estimates of seagrass loss undertaken by Oceanica (2013) estimated a human-induced disturbance of 7.95 hectares of seagrass.
- The 'current' extent of seagrass habitat is estimated as 398.70 hectare.
- Based on the above estimates, the permanent loss of seagrass habitat as a consequence of the proposal (2.06 ha, 0.52% of the LAU) results in a cumulative (historical (1.95% of the LAU) and projected (0.52% of the LAU)) loss of seagrass within the LAU of 2.47%.

Previously approved projects within 5 km of the proposal are shown in Figure 57. Those projects that impact environmental factors relevant to this proposal are discussed further in Table 87 and a summary of the cumulative impacts within 5 km of the proposal is provided below:

- Marine fauna
  - The underwater noise impacts from the Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin project has been completed. As the construction of the proposal and seismic survey will not be undertaken consecutively, cumulative impacts on marine fauna from underwater noise from these two projects will be limited to the individual proposal and not be significant.
- Terrestrial flora and vegetation
  - Approximately 53.25 ha of native vegetation has been approved, or is pending approval, to be cleared within 5 km of the development envelope. The proposal, combined with this area comprises 53.71 ha of vegetation.
  - Wadjemup / Rottnest Island encompasses approximately 1,800 ha, most of which is vegetated. If a conservative estimate is adopted, with an assumption that half of the island remains vegetated, cumulative impacts from clearing 50.42 ha of vegetation would comprise 5.97% of the vegetation present on the island, from approved clearing activities.
- Terrestrial fauna
  - Approximately 53.25 ha of native vegetation, providing potential terrestrial fauna habitat, has been approved, or is pending approval, to be cleared within 5 km of the development envelope. The proposal, combined with this area comprises 53.71 ha of potential terrestrial fauna habitat. Based on the above conservative estimate, this would comprise a cumulative impact of 5.97% of the potential terrestrial fauna habitat present on the island, from approved activities.

Overall, the proposal is unlikely to contribute to significant cumulative impacts combined with existing and reasonably foreseeable future activities.

Table 87: Assessment of cumulative impacts

Projects within 5 km of the proposal	Relevant environmental factor	Details and impact summary	Status
Native vegetation clearing permits			
7759/1	Flora and vegetation	Vegetation clearing of up to 1.99 ha.	Complete
9883/1	Flora and vegetation	Vegetation clearing of up to 2.78 ha.	Pending
7981/1	Flora and vegetation	Vegetation clearing of up to 3.35 ha.	Complete
8135/1	Flora and vegetation	Vegetation clearing of up to 1.27 ha.	Complete
5568/1	Flora and vegetation	Vegetation clearing of up to 0.002 ha.	Not progressed
5456/1	Flora and vegetation	Vegetation clearing of up to 0.23 ha.	Not progressed

Projects within 5 km of the proposal	Relevant environmental factor	Details and impact summary	Status
5448/1	Flora and vegetation	Vegetation clearing of up to 0.90 ha.	Not progressed
5641/4	Flora and vegetation	Vegetation clearing of up to 34.44 ha.	Completed as multiple walking trails.
6775/1	Flora and vegetation	Vegetation clearing of up to 2.59 ha.	Complete
8778/1	Flora and vegetation	Vegetation clearing of up to 0.40 ha.	Complete
7019/1	Flora and vegetation	Vegetation clearing of up to 0.46 ha.	Complete
10450/1	Flora and vegetation	Vegetation clearing of up to 3.29 ha	Pending
Referral to the EPA and EPBC referrals			
Rottnest Island Golf Course Upgrade	• Flora and vegetation • Terrestrial fauna	Upgrade of golf course involving treatment of wastewater for irrigation of fairways and the construction and irrigation of greens (previously sand only). Residual impacts include: • Clearing up to 0.38 ha of vegetation • Clearing up to 0.38 ha of potential habitat for terrestrial fauna. The EPA assessed the proposal as 'Scheme Not Assessed – Public Advice Given'.	Complete
Pinky's Beach Eco Retreat	• Flora and vegetation • Terrestrial fauna	The Eco-Retreat is located west of the existing campground and directly adjacent to an existing Wastewater Treatment Plant (WWTP) to the east. Residual impacts include: • Clearing of 1.8 ha native coastal vegetation • Clearing up to 1.8 ha of potential habitat for terrestrial fauna • Increased human activity on the coastal area. The EPA assessed the proposal as 'Not Assessed - Public Advice Given'.	Complete
Rottnest Lodge Development	• Flora and vegetation • Terrestrial fauna	The proposal involves the demolition and/or refurbishment of existing accommodation, the construction of new accommodation and associated infrastructure. Residual impacts include: • Clearing of up to 0.5 ha of native vegetation • Clearing up to 0.5 ha of potential habitat for terrestrial fauna.	Complete
INDIGO Marine Cable Route Survey (2017/7996)	• NA	A cable route survey from the beach utility hole in the Dunningham Reserve north Coogee to the beach utility hole at Floreat Beach in Perth. No significant impacts were identified as part of the impact assessment.	Complete
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin (2004/1700)	• Marine fauna	The proposed action was to conduct a marine acoustic survey from Coogee Beach, NSW, to Floreat Beach, WA, to the seaward boundary of the Australian Exclusive Economic Zone north of Christmas Island. Potential impacts include underwater noise impacts to marine fauna.	Complete
INDIGO Central Submarine Telecommunications Cable (2017/8127)	• NA	Installation of a submarine fibre optic cable from Perth to Sydney. No significant impacts were identified as part of the impact assessment.	Complete

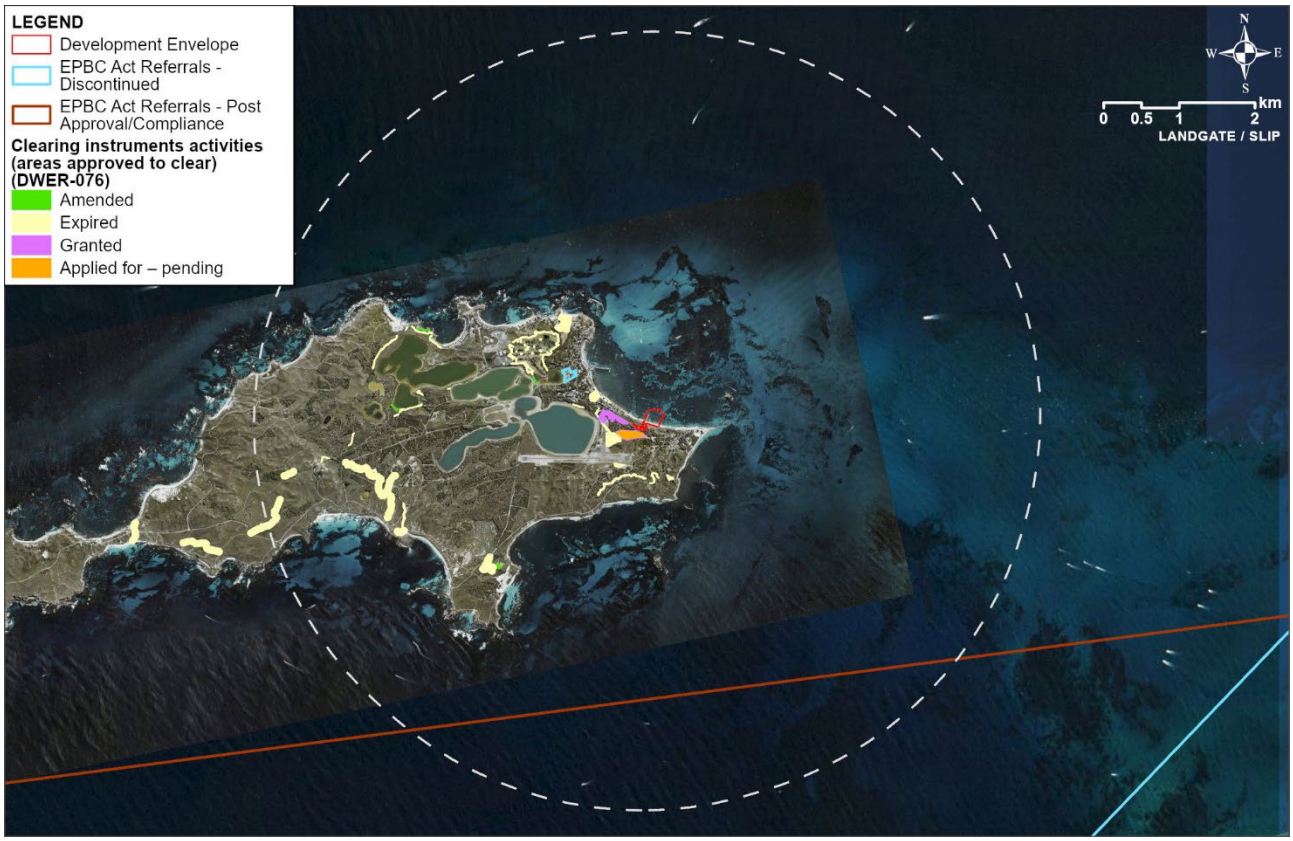


Figure 57: Projects and approvals within 5 km of the proposal

18 CONCLUSION

This Environmental Supporting Document provides an environmental impact assessment of the proposal in accordance with relevant state and federal policies and guidance. Cumulative impacts have been considered and assessed.

Significant baseline monitoring and site-specific studies have been undertaken. The footprint of the project (development envelope) is relatively small and replaces and expands an existing maritime infrastructure facility (Army Groyne) that cannot be adequately repaired or maintained.

There is a clear current and escalating future demand for the South Thomson Barge Landing Development, which will have demonstrated benefits for the wider community.

There has been significant consultation with relevant stakeholders, including traditional owners, which commenced in 2019.

18.1 Section 38 referral

The assessment has concluded that the proposal is expected to be able to meet EPA's objectives for all environmental factors, subject to the implementation of the management and mitigations measures outlined in the following management plans:

- Dredging Environmental Monitoring and Management Plan (02 Environment, 2025) (Appendix O)
- Construction Environmental Management Plan (Emerge, 2025a) (Appendix P)
- Operational Environmental Management Plan (Emerge, 2025b) (Appendix Q).

18.2 EPBC referral

MNES with the potential to occur within or proximate to the development envelope includes the following listed threatened species and migratory species:

- Listed threatened species:
  - Terrestrial fauna (quokka)
  - Marine fauna (scalloped hammerheads, white sharks and grey nurse shark, southern right whale, pygmy blue whale minke whale, Australian sea lion, loggerhead turtle, leatherback turtle and green turtle and marine bird species (in particular the Australian fairy tern, Caspian tern and crested tern)).
- Migratory species:
  - Marine fauna (scalloped hammerheads, white sharks and grey nurse shark, southern right whale, pygmy blue whale minke whale, Australian sea lion, loggerhead turtle, leatherback turtle and green turtle and migratory bird species (wedgetail shearwater, roseate tern, crested tern, Caspian tern, Australian fairy tern and bridled tern)).

No other MNES are considered relevant to the proposal. The assessment of potential impacts to MNES from the proposal identified the following:

- An assessment of the proposal against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Department of the Environment, 2013) for the Quokka identified that the proposal was not at variance to the guidelines.
- Assessment of the proposal against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (Department of the Environment, 2013) for listed migratory species (including migratory marine birds, marine turtles and whale species) identified that the proposal was not at variance to the guidelines.

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Appendix A
Construction methodology

Appendix B
Marine fauna and benthic habitat assessment, South Thomson Barge Landing Development (RPS 2024)

Appendix C
Benthic habitat assessment: Plume extension survey area, South Thomson Barge Landing Development (RPS 2024b)

Appendix D
South Thomson Bay Barge Development, Coastal Processes Assessment (Baird 2025a)

Appendix E

PER349327 – RIA peer review of dredge plume modelling and coastal processes reports (RPS 2024c)

Appendix F
South Thomson Bay Barge Development, Dredge Plume Modelling Assessment (Baird 2025b)

Appendix G
Baseline water quality laboratory results

Appendix H
SAP implementation report, Rottnest Island Army Jetty dredging (RPS 2020)

Appendix I
Flora and vegetation survey; South Thompson and Kingstown, Rottnest Island (Wadjemup) (FVC 2023)

Appendix J
South Thomson Barge redevelopment flora and vegetation survey (RPS 2024d)

Appendix K
Rottnest Island Basic Fauna Survey (EcoLogical 2024)

Appendix L
Greenhouse Gas Emission Assessment, South Thomson Barge Development Landing (Kewan Bond 2024)

Appendix M
Aboriginal cultural heritage documents

Appendix N
Assessment of benthic habitats, South Thomson Bay barge and cargo facility

Appendix O
Dredging Environmental Monitoring and Management Plan (02 Environment 2025)

Appendix P
Construction Environmental Management Plan (CEMP) Rottnest Island Authority – South Thomson Barge Landing Development (Emerge 2025a)

Appendix Q
Operational Environmental Management Plan (OEMP) (Emerge 2025b)

Appendix R
Database searches

Appendix S
Underwater Acoustic Assessment, South Thomson Barge Landing Development (Tetra Tech 2024)

Appendix T
Marine Magnetic survey at proposed barge landing site, South Thomson (Surrich 2019)

Appendix U
Rottnest Barge Facility, Rottnest Island, Acoustic Assessment (Herring Storer Acoustics 2024)

Appendix V
Spill Prevention and Response Plan

Appendix W
South Thomson Bay Barge Development Coastal Hazard Risk Management and Adaptation Plan (Baird 2025c)