South Thomson Barge Development Landing

Construction Method and Sequence

The following information is based on the following documents:

- PAEMAC (2024) *Rottnest Island Authority South Thomson Bay Barge Facility, Basis of Estimate*.
- In2Dredging (2023) *South Thomson Bay Development, Dredging Budget and Schedule Estimates*.
- PAEMAC (2020) *South Thomson Bay Development - Value Engineering Assessment.*
- AECOM (2020) *South Thomson Bay Barge Facility, Value Engineering of Concept Design*.

In addition, further detail on construction methods and sequencing was provided by the RIA Infrastructure team.

Figures and cross-sections have been included in this document for ease of understanding the construction methods and sequence. Please refer to the above-mentioned reports for more figures and cross-sections.

The construction method and sequencing will consist of:

1.0 Stage 1 – Maritime Infrastructure

1.1 Preliminaries:

This includes all planning, design and preparation works including plant/ equipment and fabrication activities. This will also include verification of the site (seabed survey) as well as any underground service location.

1.2 Mobilisation and site setup:

This includes installation of site sheds, preparation of laydown areas A and B (see **Figure 4**), erection of marine traffic management, site signage, public advertisements and mobilisation of equipment. The preparation of laydown area B will require mechanical clearing of vegetation and cut and fill of the adjacent dune to level this area. It is noted Laydown area B is located in the footprint of the onshore storage shed in Stage 2 of the project.

1.3 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 Jetty groyne or a bespoke structure (see Figure 5 in PAEMAC (2024)).
- The RORO could be located on the western side of the Army Groyne, see **Figure 1** below.
- 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.

1.4 Dredging:

Advice regarding the dredging methodology and equipment has been provided by In2Dredging (2023), who propose using a Backhoe Dredge (BHD). The process is outlined below:

- As per In2Dredging (2023) advice, dredging must be undertaken across the dredge footprint prior to construction of the breakwater and new laydown area.
- 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. In2Dredging (2023) indicate that both sand and rock can be removed using a BHD.
- 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 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 placed around the BHD may be required (pending the preparation of Dredge Management Plan) to mitigate the potential environmental impact due to the dredge plume (due to the disturbance of fine sediment fractions).
- The dredged material will be reused as fill material in the laydown/hardstand area.
- The dredging and disposal process will be repeated until the areas have been dredged completely to the required design depths.
- A dual function Survey/Crew Transfer Vessel will form part of the BHD dredging spread. The survey vessel will provide regular survey update to the BHD dredging operator and will also be used as crew transfer vessel to transport personnel from shore to vessel and vice versa.
- The excavated material will be transferred to Army Groyne via the barge at the RORO. The barge will be unloaded using a long reach excavator and loaded into 45t Articulated Dump Trucks (ADT).
- The sequence of dredging beneath future infrastructure areas (i.e. beneath the breakwater and reclamation area) will be determined by the contractor, but it is likely that dredging will occur in these area prior to construction of the new breakwater and new laydown area.

Figure 1 shows the indicative position of dredging equipment.

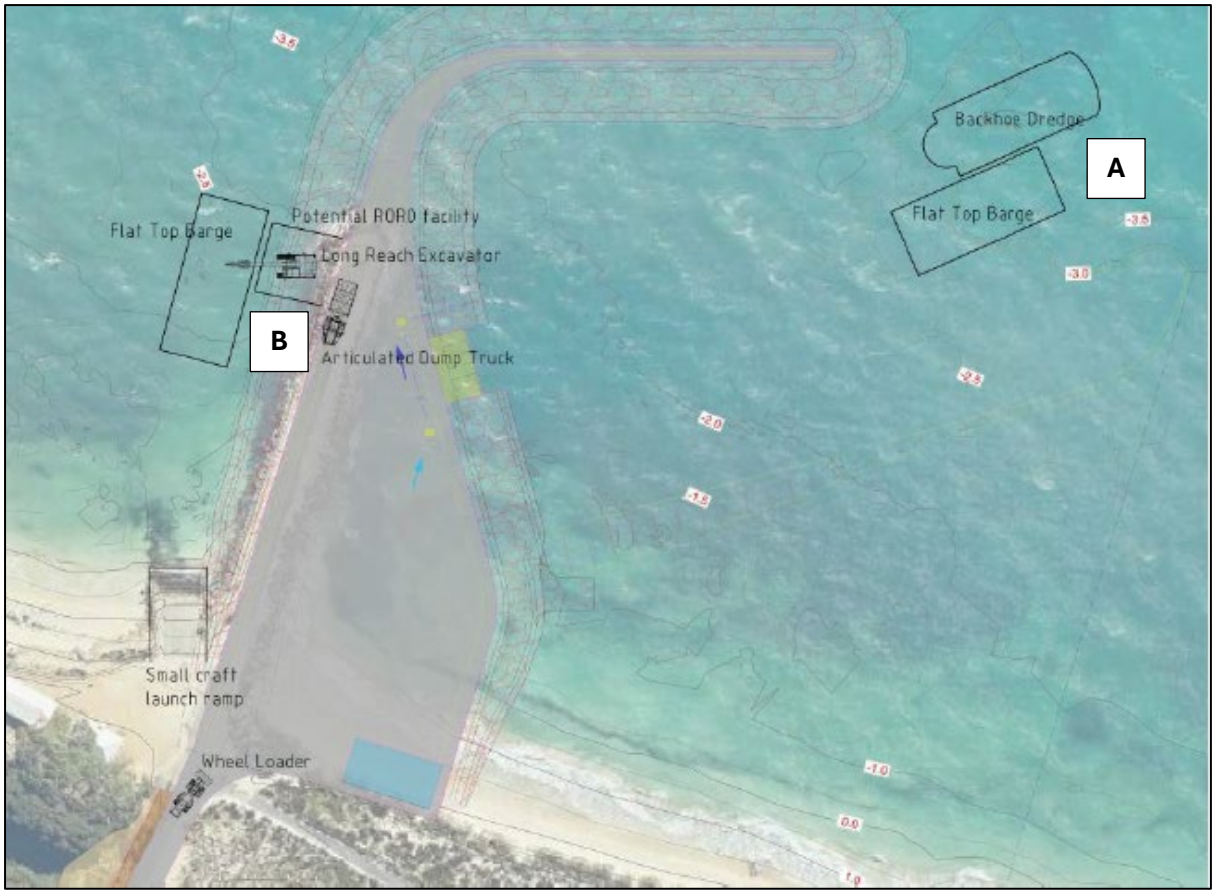

Figure 1: Indicative location of dredging equipment and barge for loading of dredge spoil (A), and location of barge and excavator on RORO facility for unloading dredge spoil into a ATD (B).

1.5 Reclamation:

The laydown area shall incorporate reclaimed dredged fill material and shall be constructed as per the process below:

- Existing armour from the eastern side of the Army Groyne will be removed and used for construction of bunding (see next step).
- Bunding will be constructed along the eastern and northern sides of the reclamation zone to allow dredge spoil to settle and remain in place. The bunding is to prevent dredge spoil from being washed away into the marine environment by waves or during high tides. **Figure 2** shows the bunding extent.
- The bunding will be constructed using core materials, followed by a geotextile filter layer and an armour layer. **Figure 3** shows a conceptual cross-section of the bunding, reclamation fill and then adjacent dredge zone.
- Using the dredged spoil, the Contractor will establish a tip head to place the dredged fill material onto the beach/into the water in the southwest corner.
- Dredge spoil will be unloaded from the ADT and pushed out over the tip head using a wheel loader or similar.
- Dredge spoil will be placed and spread in a north and east direction.
- Consistent with the progression of reclamation, the bunding on the marine side of the reclamation zone will need to progressively moved to the north to ensure that each successive round of dredge spoil placed will remain in place.
- 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.

- Material will be compacted using a static pad foot roller until a pavement level of +2.5m CD is achieved. If required, the wheel loader will assist with material placement and wheel rolling.
- Stormwater drainage will be installed followed by a layer of crushed rock basecourse and asphalt.

Figure 2 shows the process of reclamation using the dredge spoil.

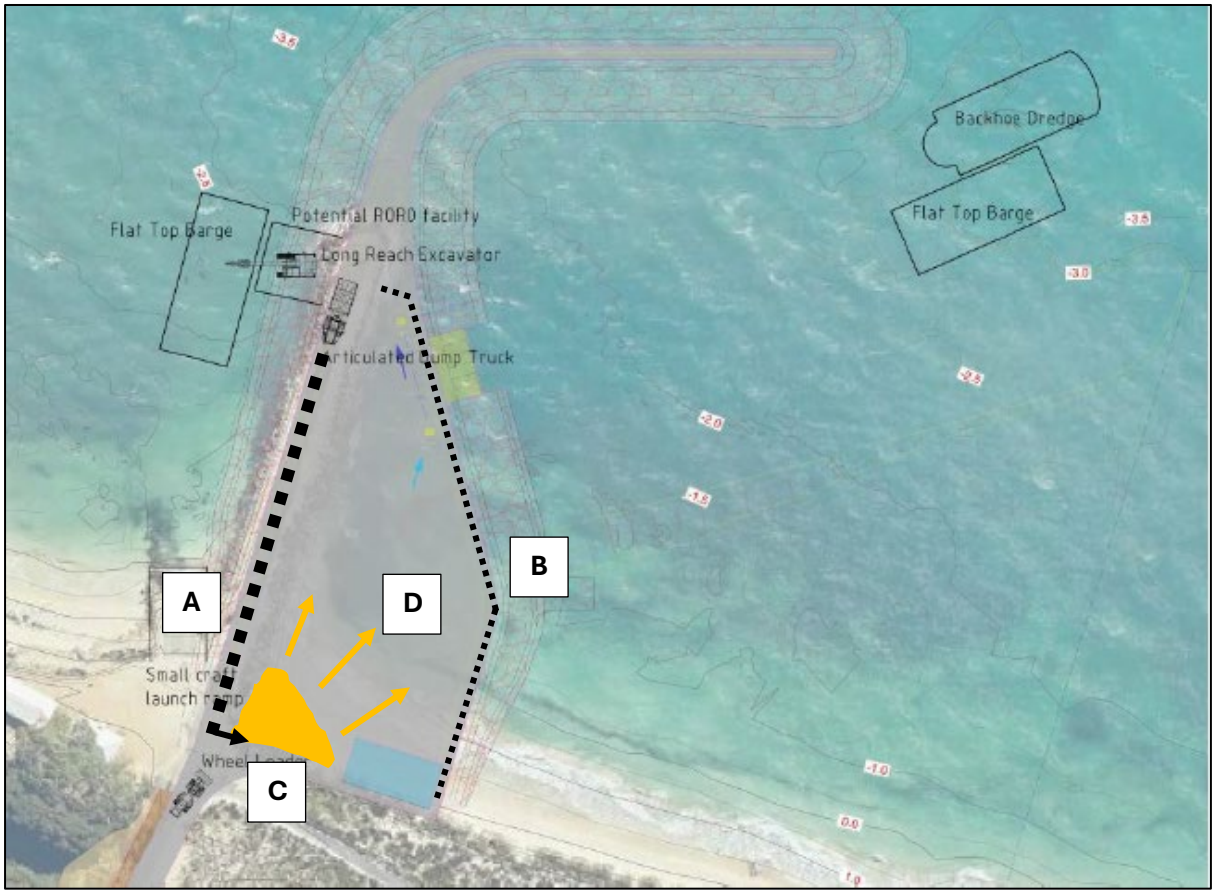

Figure 2: Indicative process for reclamation showing the Army Groyne (A), bund wall (B), placement of dredge spoil in the southwest corner of the area (C) and the direction that dredge spoil will be placed and spread (D).

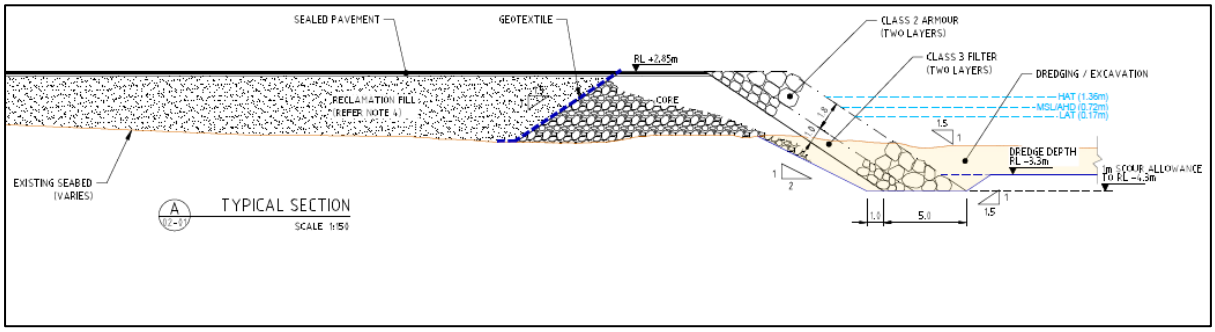

Figure 3: Conceptual cross-section of the reclamation fill, bunding and adjacent dredge zone.

1.6 Army Groyne Extension:

On completion of the reclamation works, the Army Groyne will be upgraded as per the following process:

- Remove excess rock/materials and reshape existing 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 rock armour (Class 2) along exposed batter.
- Place rock armour (Class 1) along northern breakwater.
- Place a layer of crushed rock basecourse and asphalt along the Army Groyne extension to match that placed in the reclamation area.
- The placement of rock will be largely undertaken from the marine side whereby rock is picked from an adjacent barge and put into place. Some rock may be placed from the land side (i.e. rock temporarily stored in the laydown are from the original Army Groyne wall). It is expected that other materials (crushed rock, bitumen) will also be loaded from the marine side onto the facility alleviating the need for use of the barge landing at the Main Jetty.

The various rock armour classes to be used in the structure are shown in **Figure 4**.

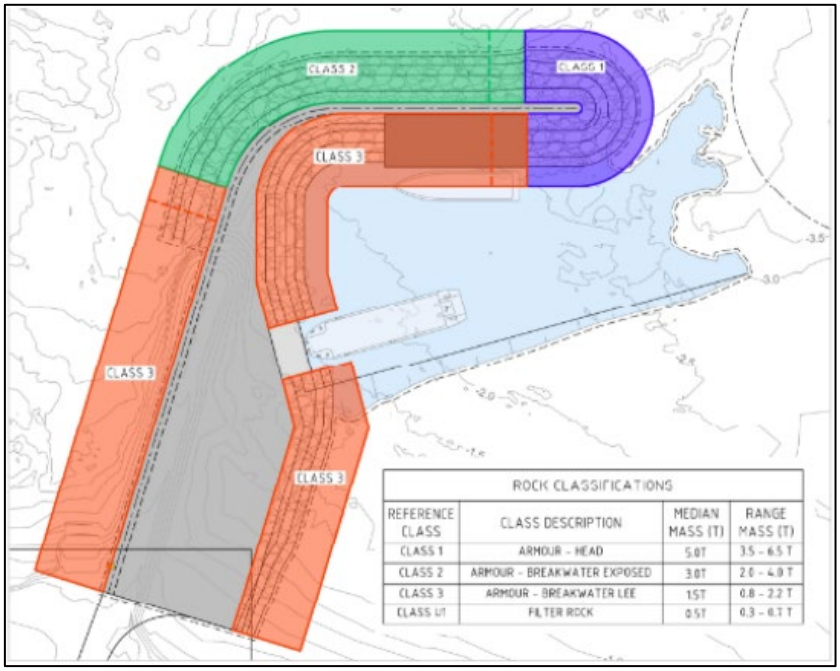

Figure 4: Conceptual cross-section of the reclamation fill, bunding and adjacent dredge zone.

1.7 Maritime Infrastructure:

Includes the Barge Landing Ramp. PAEMAC (2024) expected that these works would occur concurrently with construction of the rock armour revetments to allow piles to be installed prior to revetments being built. Should a staged approach be followed by the Contractor, 1200mm sleeves will need to be installed in the armour so the Stage 2 piles can be installed through the armour.

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 No.4 (TBC) mooring piles to a maximum depth of 10 m (TBC) using a Vibro-Hammer.
- It is expected that the installation of the above-mentioned items will be undertaken either from the marine side or reclaimed area.

1.8 Services:

Underground services will be installed and connected to onshore underground services using small excavators/small plant via excavation of shallow trenches that will be backfilled. 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).

1.9 Storage shed:

These works consist of construction of the shed structure and hardstand in the south-east corner of the reclamation zone**.** The extent of intrusive works for this scope of work is expected to be minimal.

1.10 Road works:

These works consist of road work construction including:

- Cut and fill of the Army Jetty Road using mechanical means
- Kerbing
- Signage
- Asphalt paving
- Line marking
- Drainage
- These works includes completing any sections of the new facility and the road section that links to the Army Jetty Road.

1.11 Demobilisation:

On completion of the works, a hydrographic survey of the site will be undertaken to ensure any debris on the seabed has been removed. Other activities include:

- Removal of site offices
- Dismantling RORO and equipment
- Removing all equipment from site.

2.0 Stage 2 – Onshore infrastructure and ferry berth

2.1 Ferry berth:

This structure is intended to be constructed during Stage 2 of the project and will comprise:

- Installation of piles using a Vibro-Hammer rig operated from a barge located adjacent. The dimensions and number of piles is estimated at 16 X 610mm (TBC) that will be installed to a depth of 15 m (TBC). As noted previously, if the Contractor does not install piles concurrently with construction of the breakwater, then 1200mm sleeves will need to installed in the rock armour so piles can be driven through the sleeves.
- Installation of a precast concrete deck and surface.
- Fit out of the wharf with fenders, fender chains, mooring bollards, signage, lighting.
- It is expected that the installation of the above-mentioned items will be undertaken from the marine side.

2.2 Small Craft Landing:

The Small Craft Landing works 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 X 500mm (TBC) that will be installed to a depth of 10 m (TBC). As noted above, if the Contractor does not install piles concurrently with construction of the breakwater, then 1200mm sleeves will need to installed in the rock armour so piles can be driven through the sleeves.
- Installation of abutment.
- Installation of floating deck units.
- Installation of navigational aids.
- It is expected that the installation of the above-mentioned items will be undertaken from the marine side or reclaimed area.

2.3 Storage building:

These works consist of construction of the storage shed structure and hardstand to the east of Army Jetty Road. Vegetation clearance, cut/fill and levelling of this area will have already been completed during the mobilisation phase in Stage 1. The extent of intrusive works for this scope of work is expected to be minimal.

3.0 Works schedule

Appendix C of PAEMAC (2024) provides an indicative works schedule.

4.0 Equipment

Please refer to PAEMAC (2024) for an indication of the equipment to be used.

5.0 Disturbance footprints

5.1 Laydown Areas:

It is proposed that two laydown areas will be required as shown in **Figure 5**. One laydown area will be located in the onshore storage shed that will be constructed in Stage 2 of the project. Shapefiles of the footprint can be provided.

Figure 5: Proposed laydown areas ‘A’ and ‘B’.

5.2 Proposed disturbance footprint:

The proposed disturbance footprint is shown below in **Figure 6**. Shapefiles of the footprint can be provided.

Figure 6: Proposed total disturbance footprint (Red line).