

PORT OF DURBAN

UPGRADE OF ISLAND SEAWALLS IN THE PORT OF DURBAN

CONSTRUCTABILITY REPORT

2128137-ENG-RPT-0002

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Constructability Report

Access to Island View berths 1 – 8 is limited and restricted. The design of the seawall upgrades will therefore make allowance for the constrained access and construction areas in this region. Access along the western and northern shoreline and at berth 9 is less constrained.

The construction sequence outlined in this section is indicative only. The contractor will need to develop a sequence specifically for the plant, equipment and the temporary works proposed for construction. A summary of the site accessibility with regard to land access is shown in Figure 1. The figure shows from berths 2 to 10 no land-based construction will be possible.

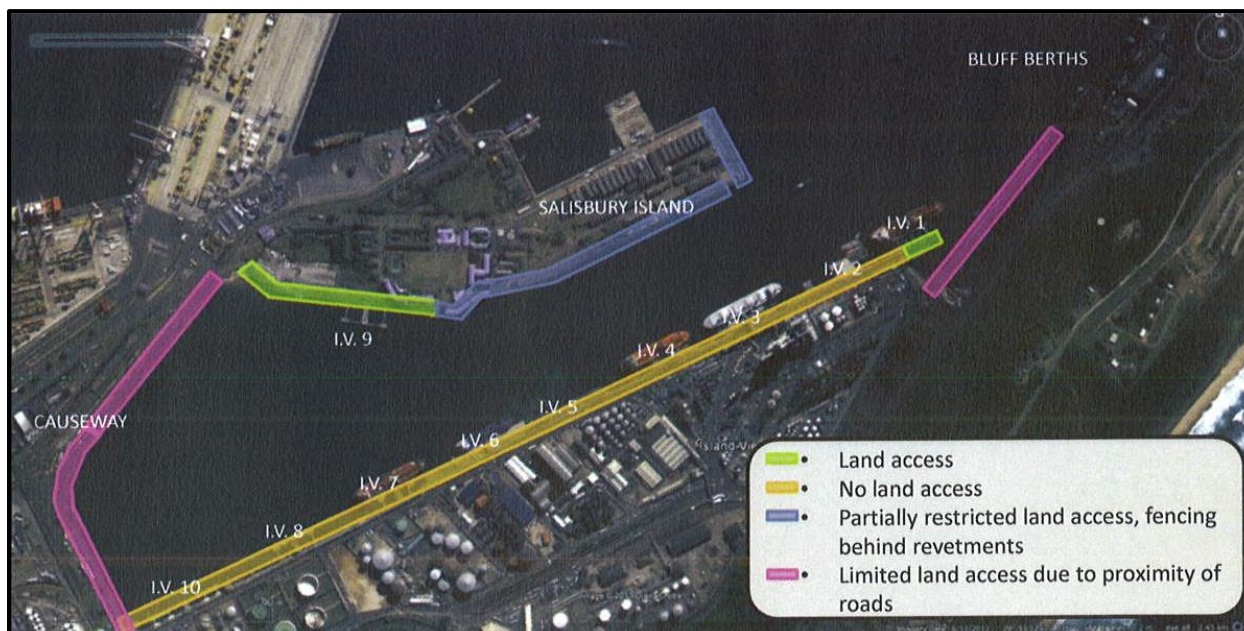


Figure 1: Accessibility

Rock revetments are constructed from the bottom (toe) up. Where there is a rat proofing the grouted stone will first be demolished prior to the placement/construction of a new revetment. This is to provide better stability and cohesiveness of the revetment and so as not to risk the potential of slope slippages. Where possible a geotextile should always be placed prior to the filter layer. This will help prevent fine material from washing out from behind the revetment.

1. MARINE BASED CONSTRUCTION

The proposed sequence of construction is illustrated in Figure 2 and is as follows:

- Filter and armour rock will be transported to and stockpiled at Salisbury Island behind Berth 9.
- A front end loader will be used to load hopper barges from the Berth 9 mooring dolphin
- The hopper barges will transport rock to the site and bottom dump the rock.
- A long reach excavator on a spud barge will be used to place, spread, and profile the rock as required.
- A dive and hydrographic survey will be done to check the levels and profiles

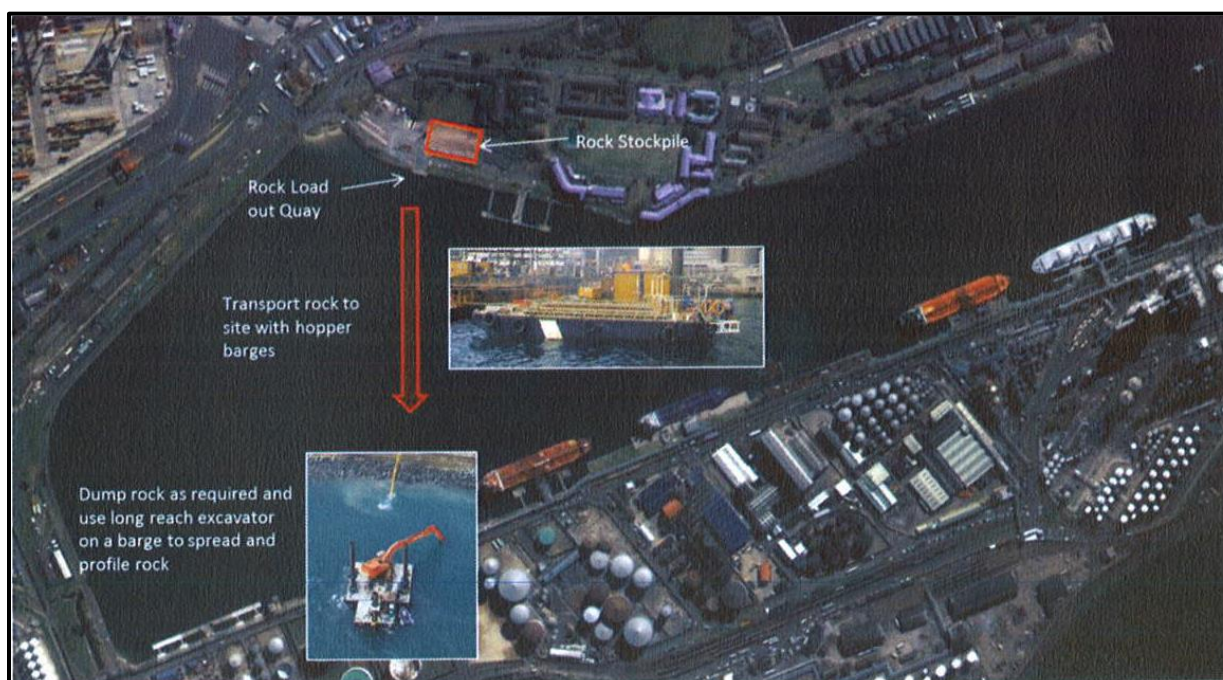


Figure 2: Marine Side Construction

2. CONSTRUCTION SCHEDULE

The project has been broken up into multiple sections. The sections have been discussed and agreed with TNPA and are grouped based upon their location, continuity of work, priority for TNPA, type of construction activities and to allow flexibility during operations.

- a) **Berths included:** Mole, Berth 1 to Bunker berth – the scope excludes Berth 2, 4, 5, and 6.

The Figure 3 below provides a detailed depiction of the Island View Terminal.



Figure 3: Island View Precinct

2.1. MOLE, BERTH 1 TO BUNKER

The Island View Terminal generates income for the Port and works will disrupt terminal operations. Any damage to the terminal infrastructure that affects berthing could result in significant operational losses for the Port and its tenants. This phase of the upgrade to revetments entails areas that need to retain the revetment slope and to allow dredging and scour protection to take place on the offshore side of the wall to achieve the advertised depths at the cope line. The slopes on the inshore side need to be upgraded and protected with rock revetments. With the exception of Berths 2, 5 and 6, the upper section of the slopes between piles and under the quay decks also need to be protected with rock. These areas have restricted access and the construction methods need to be carefully considered.

Landside access for construction activities is not available for this location of the works, due to safety risks relating to the existing operations and landside space limitations between berths.

2.1.1. Philosophy to define access dates and sectional completion dates

Prior to preparing the Construction Schedule, it is important to understand the constraints put on the Contractor's activities. In this case, work is significantly affected by shipping and a philosophy for providing flexible access and sufficient time for the Contractor to carry out his works as needed. Stipulating Sectional Completion Dates and applying Delay Damages for late completion of

sections is the recommended approach to incentivise the Contractor to complete the works within the time given. The time to complete sections should include reasonable Time Risk Allowances (TRAs) to deal with uncertainty that causes delays. Providing too short a window for the Contractor to carry out his works will apportion more risk to the Contractor and inflate the contract price. Providing too long a window would result in less of an incentive for the Contractor to complete the works in the shortest possible time. A balance is therefore necessary, and the programme risks should be allocated to the party best suited to mitigate the risk.

To allow maximum flexibility during construction and minimum downtime of berths, a procedure is proposed to manage the contractor's access to each Section. A flow chart of this procedure is shown in Figure 4.

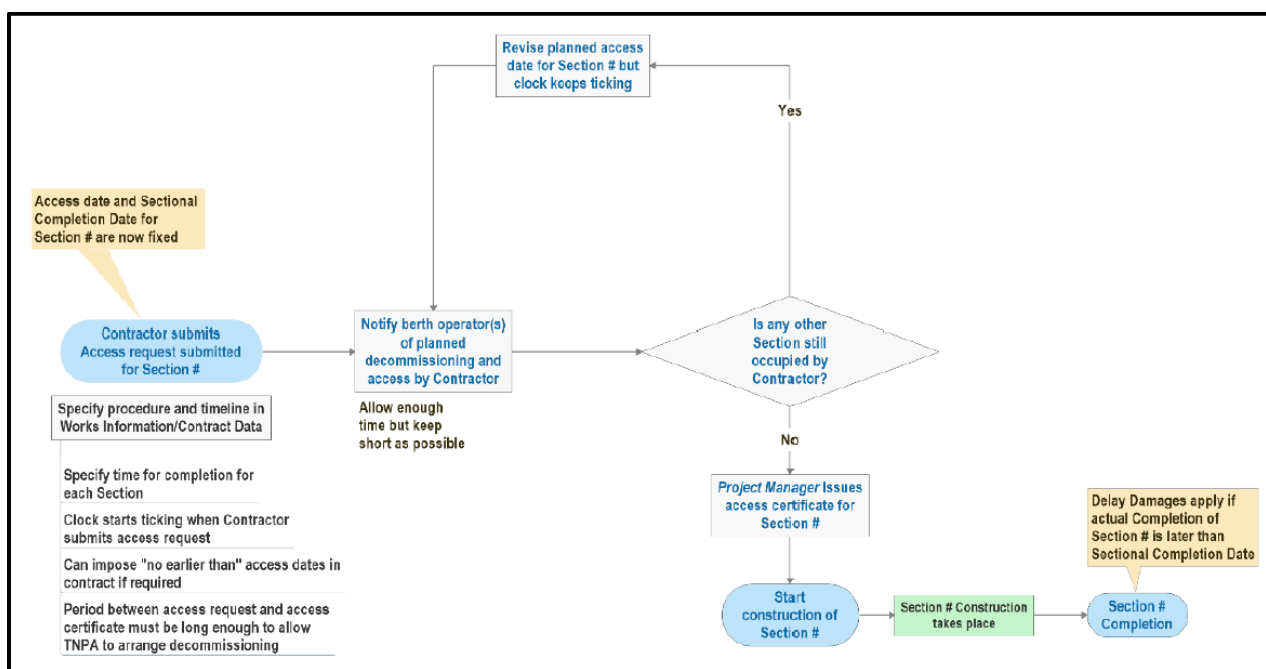


Figure 4: Philosophy of Sectional Completion

The Contractor will be best placed to plan his works optimally and to determine when access is needed. The procedure provides for the Contractor to initiate a request for access to a particular section. This will trigger a fixed time to allow TNPA to decommission the applicable berth(s). The advance notice to TNPA to organise decommission of a berth should be long enough to enable TNPA to make the necessary arrangements and to avoid delaying the Contractor, but as short as possible to limit berth downtime.

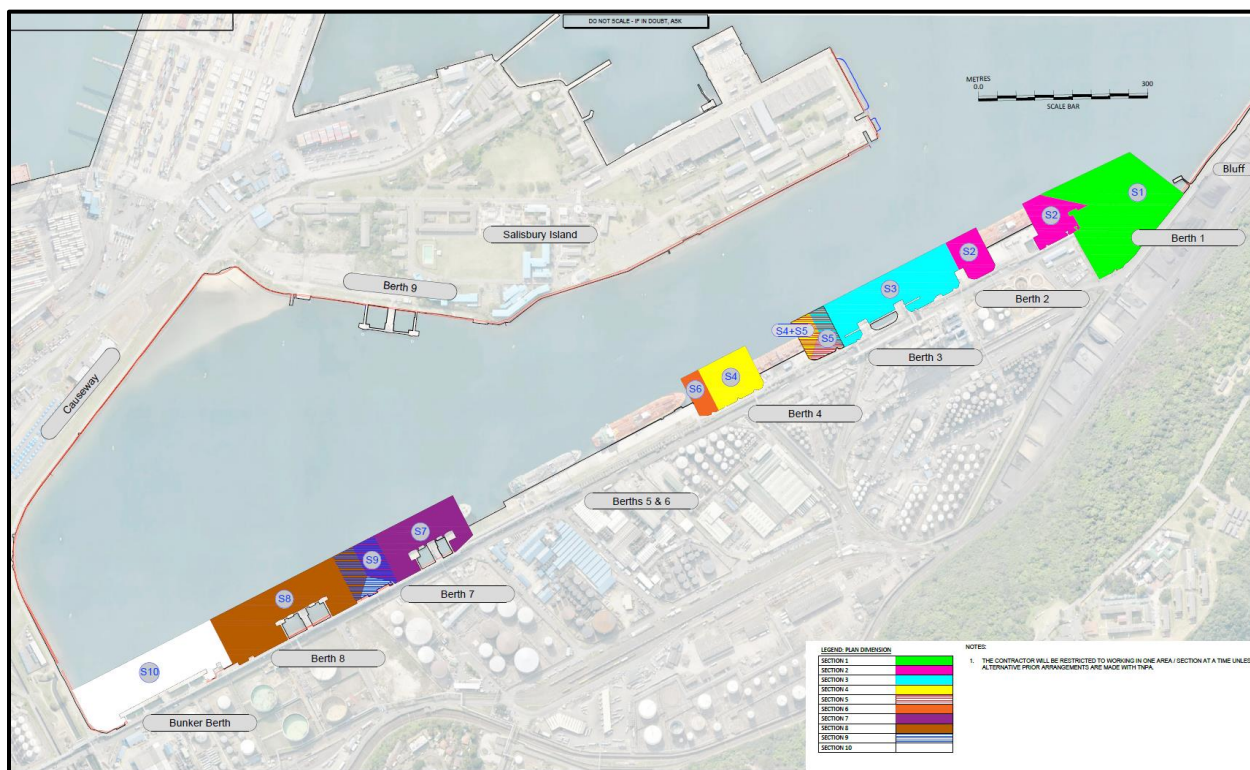


Figure 5: Construction Sequence

Since landside access is very limited, the breaking up of rat-proofing and the placing of rock for the revetment will also be carried out by marine equipment. This will likely be carried out by hydraulic breakers/excavators on barge(s).

The placement production of smaller grades of rock (blinding layer, filter layers, etc.) is estimated to be 400 m³/day, while larger armour rock is estimated to be placed at 300 m³/day by an excavator from a barge. The Geotextile layer will likely be placed by the LRE and divers. The placement production of geotextile is estimated to be 750 m²/day.

The placement of rock under berth decks and around piles will be difficult and low production rates of 160 – 200 m³/day or lower can be expected. Construction methodology in these areas will be contractor specific and will be based on their available equipment, experience and specific skills. A small excavator may be used at Berth 1. A long reach excavator on a barge may be used to place rock behind Berth 3 and Berth 10, and a large barge crane may be used to place rock behind Berth 7 and Berth 8. Alternatively, a mini barge crane small enough to manoeuvre under the walkways and between piles at low tide may be used for this purpose. The Contractor may need to build a purpose build small barge which only handles two or three armour rocks at a time for the placing of rock under the berth decks and between the piles. The geotextile will be installed by divers.

FEL 4 Construction	Duration (months)
Site Establishment	2
Transnet Approvals (H&S, Environmental, Quality, Inductions, MS etc)	1
Procurement of material, testing of rock at the quarry and stockpiling	Ongoing
Removing obstructions and/or trimming the existing revetment rock	Ongoing
Placement of blinding layer	Ongoing
Placement of geotextile fabric by divers	Ongoing
Profile surveys and quality checks	Ongoing
Upgrade section 1 (Place filter layer and armour layer)	3
TNPA Application for berth occupancy	1
Upgrade section 2	2
Upgrade section 3	2
Upgrade section 4	2
Upgrade section 5	2
Upgrade section 6	2
Upgrade section 7	2
Upgrade section 8	2
Upgrade section 9	2
Upgrade section 10	2
Multiple tie-ins and interfaces with existing concrete structures; and	Ongoing
Extending the existing stormwater outlet pipes.	2
Demobilization: Remove temporary infrastructure	1

The process for berth occupation procedure is below.

- Contractor submits to TNPA Project Manager access request for particular section.
- TNPA Project Manager notifies Harbour Master and berth operators of planned decommissioning and access by Contractor.
- Harbour Master approves request.
- TNPA Project Manager issues access certificate for the section requested.
- Section construction and completion.
- TNPA Project Manager notifies Harbour Master and berth operators of section completion.
- Contractor initiates request for access to the next section (allow sufficient time for request to be approved).
- Commissioning and handover of completed section to TNPA operations.