

Te Awaparahi Bay Reclamation Project

Reclamation Rehabilitation Plan (Landscape)

Prepared for Lyttelton Port Company Ltd.

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Document Quality Assurance

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1.0 Introduction

The following 'Reclamation Rehabilitation Plan' (RRP) has been prepared by Boffa Miskell Ltd as part of a consent application by the Lyttelton Port Company (LPC) for the 'Te Awaparahi Bay Reclamation Project' (Project). This report recommends landscape treatment methods that respond to the landscape-related statutory requirements for the application.

The activities associated with the reclamation and wharf construction are classified as Controlled Activity under the Regional Coastal Environment Plan. The RRP describes the proposal and the landscape context of the sites and addresses the conditions of control through rehabilitation objectives and proposed methods based on ecological outcomes and long-term management. The RRP also makes recommendations to address these matters of control.

This report was written with reference to the Cawthron Institute Eco-Engineering Report ('Te Awaparahi Bay Reclamation Project: Eco-Engineering Feasibility Assessment') referred to hereon as 'Eco-Engineering Report' - and the 'Te Awaparahi Bay Reclamation Project Report', Beca (2017).

2.0 Summary Description of the Project

The Project includes:

- The construction of an approximately 21 ha reclamation and
- The construction of a 700m long wharf (totalling approximately 3 ha in area).

The proposed reclamation would extend into Te Awaparahi Bay from an existing 10 ha reclamation that is near completion and from the existing coal stockyard as shown on **Figure 1** below. Construction is proposed to be separated into two stages, of approximately 5 ha and 16 ha each.¹

¹ More precisely, the stage one reclamation is anticipated to be approximately 4.75 ha while stage two would be 16.25 ha.

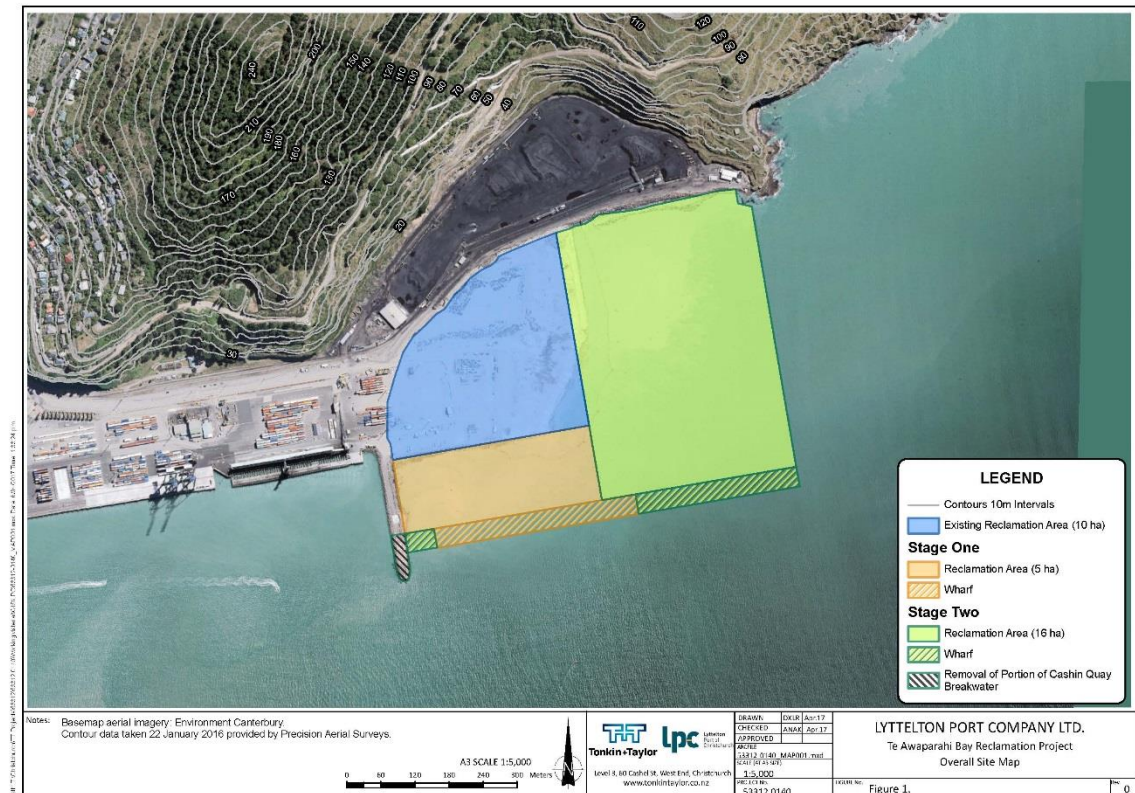


Figure 1: 'Location of the Proposed Reclamation and Wharf Areas': Source Tonkin and Taylor Ltd. Nts.

The use of the reclaimed land for port activities is not covered by this application and consent for this will be sought at a later date.

A summary of the project is provided below. Further details are contained in the Project Description contained in Chapter 2 of the Assessment of Environmental Effects in the application.

Stage one involves:

- Removing soft-sediment under the proposed bund footprint using a dredger. The removal of sediment will reduce the settlement time of the bund and therefore enable the wharf to be constructed earlier than would otherwise be the case;
- Constructing the southern engineered bund primarily by end-tipping rock onto the leading face of the reclamation and pushing rock into the sea using a bulldozer;
- Extending the southern bund approximately 50m beyond the proposed eastern end of the reclamation to enable the construction of a 350 m long stage one wharf;
- Reclaiming the land by end-tipping. This would commence once a sufficient length of the southern bund is in place; and
- Constructing the wharf after sufficient settlement of the reclamation and bund has occurred.

Construction material will be primarily from rock and fill material excavated from the port-owned quarry at Gollans Bay. Larger rocks would be used to armour the bund to prevent erosion from the sea.

The overall construction programme for stage one is expected to take between 6 ½ to 8-years.

Stage two involves:

- Constructing a southern and an eastern bund concurrently which would join to create a perimeter bund around a reclamation paddock; and
- Infilling of bulk material into the reclamation paddock enclosed by the bunds. This material would include either one or more of the following:
 - Bulk fill from the quarry;
 - Dredge spoil pumped into the paddock from a dredger; and
 - Material imported from elsewhere by truck.
- Constructing the stage two wharf, of which 290m is to be located to the east of the stage one wharf and 60m is to be located in the gap between the stage one wharf and Cashin Quay Breakwater; and
- Removing the end of Cashin Quay Breakwater so the western end of the wharf can be accessed by vessels.

The construction of the stage two bund and reclamation is expected to take approximately 15 years (including allowance for settlement) and the construction of the stage two wharf a further two years. The stage two perimeter bund is proposed to be constructed some 8-10 years after the stage one bund and land reclamation is complete and so it may take up to 35 years for the project to be completely finished.

A land-based or a vessel-based excavator may be used on occasions to finish the batters on the bund and a vessel-based excavator may also be required to finish the underwater toe for the stage two bund. Machinery to sink the wharf piles will also be required.

3.0 Statutory Framework

The following Policy and Rules have formed the basis for the preparation of the RRP for the Te Awaparahi Bay Reclamation Project.

1. Regional Coastal Environment Plan (RCEP), Rule 10.20 – Reclamation in Te Awaparahi Bay conditions:
 - a) Design of finished seaward faces, including visual treatment of the reclamation edge.
 - g) Methods to manage and offset visual changes.
 - i) Methods to implement any offset mitigation or environmental compensation package which has been offered by the applicant.
2. Regional Coastal Environment Plan (RCEP), Policy 10.1.11 – New Container Terminal in Te Awaparahi Bay:

- 4) Methods are employed, such as the design and treatment of the reclamation edge, to reduce visual changes associated with the reclamation.

4.0 Description of the Site and Landscape Context

4.1 The Site

The Te Awaparahi Bay Reclamation Area (the *Site*) is shown on **Figure 1** and **Figure 4**.

Other parts of LPC land nearby are referred to as part of the landscape context surrounding these sites. These include; the connecting Haul Road, and the surrounding land in LPC ownership, and the 'Port Saddle area'. The Site and surrounding areas are identified in Appendix 1 **Figure 4** 'Reclamation Rehabilitation Plan'.

The reclamation in Te Awaparahi Bay extends approximately 550 metres southward into the harbour from the existing coal yard, and approximately 750 metres eastward from the existing container terminal area and existing breakwater. This is an area of harbour water and seabed of approximately 21 hectares facing the outer eastern harbour area. It is an extension of an existing reclaimed 10 hectare area previously consented, and is proposed to form part of an extended Port infrastructure area. This area of water is closely associated with the port industrial activities to the west while to the east the Site is exposed to the outer harbour area which is less modified and subjected to natural coastal processes such as sea swells and winds.

4.2 Lyttelton Harbour Landscape Context

In a broader landscape sense, the Port Hills are valued by the Christchurch and Banks Peninsula communities for their recreational, geomorphological, ecological, historic and scenic values. In particular, the volcanic landscape of the upper slopes and main ridgeline of the Lyttelton crater rim is well-known and used for recreational purposes, with a network of roads, walkways and cycle tracks providing good access. The wider harbour also provides swimming and boating opportunities from where the extensive crater rim bluffs and volcanic landforms, and lower slopes create a memorable backdrop and skyline.

The coastline in Lyttelton Port and east to Battery Point has been heavily modified by port industry, creating flat land, linear shorelines and breakwaters that enclose the harbour. Te Awaparahi Bay coal yard and shoreline typify the reclamation and modification that has occurred throughout the port area. The Lyttelton Port area is the most modified part of the coastline within Lyttelton Harbour. The activity in the port area generally, and in the coal yard in particular, has a distinct industrial nature and scale. The Port environment is one of continual activity, and noise, with large scale buildings, ships, trains, stockpiled material, and other port infrastructure.

Gollans Bay, beyond Battery Point, is a broad and shallowly indented bay with steep uniform slopes and bluffs towering above it. The quarried terraces below Evans Pass are a notable landscape element of the backdrop.

The Lyttelton area (including the Sites) occupies the steep, south facing, inner flanks of the extinct Lyttelton volcano crater that is part of the Port Hills. The crater rim and its upper slopes are lined with steep bluffs and large rock outcrops, that together create a distinctive natural feature and skyline. The slopes east of Lyttelton remain largely undeveloped by housing or industry and are primarily in semi-improved exotic grasslands with areas of regenerating native shrub and scrublands. There is an area of pine forest on the prominent spur on 'Urumanu Reserve' above Te Awaparahi Bay that separates the bay from Lyttelton.

5.0 Te Awaparahi Bay Reclamation Design

5.1 Recommended Objectives for Reclamation Seaward Faces Design

We recommend the following objectives for the design of finished seaward faces, including visual treatment of the reclamation edge:

- To design the seaward edges in a manner that would allow for kaimoana habitat to potentially be established using eco-engineering methods (refer to Eco-Engineering Report)
- To design the eastern seaward edges to integrate as much as is practicable with the coastal character of the eastern coastline from Battery Point to Gollans Bay.
- To create a seaward edge that provides for coastal amenity and a degree of natural character when experienced by recreational users of the harbour.

The existing seaward faces of the reclamation area (10ha) are a mixture of natural basalt and some scoria rock of varying colours and sizes (**Figure 2**), as well as temporary concrete hard fill along unfinished edges (**Figure 3**). These have a haphazard appearance expressing the tipped placement of the rock along the edges, although where rocks have been placed for longer periods the rocks have settled, creating a more natural appearance than when first placed. The dispersal of rocks into the water also contributes to a more natural appearance. These older sections of rock riprap have also been colonised by aquatic vegetation (kelp) and some algal growth (**Figure 2**). As explained in section 5.2 below, the more natural appearance indicated in **Figure 2** is preferred for the reclamation edge.



Figure 2 Section of stone riprap near the reclamation facing south after approximately 60 years of placement (with regular maintenance).



Figure 3 Existing temporary eastward face of reclamation (Nov 2016) after approximately 24 months of placement.

5.2 Proposed Eastern Seaward Edge Treatments

The following methods are proposed to treat the seaward faces of the reclamation edge, and implement the Regional Coastal Environment Plan (RCEP), Rule 10.20 – Reclamation in Te Awaparahi Bay conditions, and the policy noted in section 3 above. These proposals are illustrated in Appendix 1 **Figure 4**.

Method 1: Natural Rock for the Reclamation Edge

The design of the eastern seaward riprap will use locally-sourced volcanic rock (from the Gollans Bay Quarry or offsite quarries) to create the seaward coastal protection. These rocks will be similar in colour and appearance and any variations in colour should be dispersed amongst the dominant rock colour.

Method 2: Reclamation Intertidal Profile

It is proposed that a terraced intertidal eastern seaward edge profile is created. This would include a bund on the upper level of the seaward reclamation edge (refer to Te Awaparahi Bay Reclamation Project Report, Beca (2017)). Although the main design purpose of this bund is to minimise edge instability and reduce wave-focussing effects on Battery Point, it also creates an intertidal area and to some extent an irregular appearance to the seaward face contributing to a naturalistic edge appearance. Overtime, this edge treatment may contain rock pools and variation to the edge outline providing for potential habitats (refer to 'Eco-Engineering Report'), and the establishment of aquatic plant growth adding to a natural appearance.

Method 3: Native Coastal Planting

The eastern seaward face of the reclamation will be very exposed to coastal wind, waves and salt spray. A range of coastal plant species will be initially trialled in test plots along the eastern seaward edge of the reclamation to test establishment and survival rates in this environment.

It is recommended that 6 planting test plot areas are created in locations visible from the harbour. Each of these will be 4 x 10 metres in size and spaced equally along the eastern

seaward edge starting at the land edge and ending at the southern tip of the Stage 2 area. This work could be undertaken once the edge bund and final form has been constructed. Test plot areas would need to be protected from construction activities.

The planting test plots will require:

- Soil treatment suitable for particular plant species.
- Planting to be undertaken between the months of April to August (using sufficiently 'hardened-off' nursery stock).
- Maintenance of plants to provide watering during the first 12 month establishment period, and removal of weeds and pests if present.
- Monitoring for a 2 year period after planting to assess the survival rates of different species.
- Preparation of an extended planting plan including longer term maintenance for the entire length of the eastern seaward edge planting based on the outcomes of the 2 year test period.
- Below is a proposed plant species list for trialling along the seaward edge of the reclamation (this is not a definitive list and other native coastal plants may be trialled also).

Plant Species	Common Names
<i>Myoporum laetum</i> (subject to engineering design to prevent roots undermining the seawall riprap)	ngaio
<i>Austrofestuca littoralis</i>	sand fescue
<i>Coprosma acerosa</i>	sand coprosma
<i>Desmoschoenus spiralis</i>	pingao
<i>Disphyma australe</i>	NZ ice plant
<i>Euphorbia glauca</i>	shore spurge
<i>Muehlenbeckia complexa</i>	pohuehue
<i>Muehlenbeckia ephedroides</i>	leafless pohuehue
<i>Phormium tenax</i>	flax / harakeke
<i>Poa cita</i>	wiwi/silver tussock
<i>Spinifex sericeus</i>	spinifex

5.3 Methods to Manage and Offset Visual Changes

The following areas of landscape restoration and enhancement contribute to the management and offsetting of the visual changes created by the reclamation (as shown on Appendix 1

Figure 4):

1. The proposed treatments to the eastern seaward edge described in section 5.2 above are likely to improve the coastal amenity and natural character of the reclamation edge.
2. Native planting is proposed as part of the separate consent (CRC111660) for the Haul Road behind the coal yard and reclamation area, on the slopes above the reclamation, which will in time improve the natural backdrop of the reclamation.
3. An existing area of native vegetation was established above the coal yard and below Sumner Road by Lyttelton Harbour Board in the 1970s. Canopy cover has generally been achieved in this area creating habitat and self-regeneration. Ongoing maintenance and management of this area will be undertaken by LPC.
4. LPC owns land above the reclamation adjacent to the CCC Urumau Reserve, known as 'Port Saddle'. This land has been set aside for ecological restoration and recreation activities. In collaboration between the Banks Peninsula Conservation Trust (BPCT) and LPC, work on planting and public access has begun in this area.
5. As part of the Ohinehou/Lyttelton Restoration Project an area of land below the Sumner Road on the slopes above the reclamation area is proposed for native revegetation. The land to be planted with native plant species is owned by LPC. Refer to Appendix 1, **Figure 4**.
6. LPC currently undertakes weed management of land in their ownership extending from Cashin Quay to Gollans Bay.
7. It is recommended that an overall co-ordinated Reclamation Rehabilitation Plan is updated to allow the maintenance of native plants for these areas shown in **Figure 4** (through primarily weed and pest control) during the reclamation construction period and beyond. The primary objective being to provide management of areas of self-regenerating native vegetation on the rear slopes of the container port through to Gollans Bay Quarry. In the long term this would provide a co-ordinated landscape offset by further enhancing ecological and biodiversity values as well as the natural landscape amenity of the backdrop to the reclamation area.

6.0 Appendix 1 - **Figure 4** 'Reclamation Rehabilitation Plan'

