



# LYTTELTON PORT COMPANY COAL STOCKYARD EXPANSION

## Terrestrial Ecology Assessment

July 2010



# Lyttelton Port Company Coal Stockyard Expansion

---

## TERRESTRIAL ECOLOGY ASSESSMENT

*Prepared for*  
Lyttelton Port Company  
*by*  
Boffa Miskell Limited



**July 2010**

---

**LYTTELTON PORT COMPANY**  
**PROPOSED COAL STOCKYARD EXPANSION**

---

## **Table of Contents**

<b>1.0</b>	<b>Summary</b> .....	5
<b>2.0</b>	<b>Introduction</b> .....	8
2.1	Purpose and scope.....	9
<b>3.0</b>	<b>Methods</b> .....	11
3.1	Review of existing information.....	11
3.2	Field surveys.....	11
3.3	Significance Assessment.....	11
<b>4.0</b>	<b>Description of the Existing Environment</b> .....	13
4.1	Site overview.....	13
4.2	Gollan’s Bay quarry and environs.....	14
4.3	The proposed haul road alignment.....	16
4.4	Te Awaparahi Bay.....	17
<b>5.0</b>	<b>Significance Assessment</b> .....	18
5.1	Existing quarry – assessment against BPBP definition.....	18
5.2	Existing quarry – assessment against BPBP criteria.....	18
5.3	Proposed quarry footprint – assessment against BPBP definition.....	19
5.4	Proposed quarry footprint – assessment against BPBP criteria.....	19
5.5	Slopes above the proposed quarry footprint.....	20
5.6	The proposed haul road alignment.....	21
5.7	Te Awaparahi Bay.....	21
<b>6.0</b>	<b>Assessment of Effects</b> .....	22
6.1	Gollans Bay quarry and environs.....	22
6.2	The proposed haul road alignment.....	23
6.3	Te Awaparahi Bay.....	24
<b>7.0</b>	<b>Proposed mitigation and monitoring</b> .....	25
7.1	Gollans Bay quarry and environs.....	25
7.2	The proposed haul road alignment.....	26
7.3	Te Awaparahi Bay.....	26
<b>8.0</b>	<b>Conclusions</b> .....	27
<b>9.0</b>	<b>Literature cited</b> .....	28
	<b>Appendix 1. Definition of Significant Indigenous Vegetation</b> .....	29
	<b>Appendix 2. Method 1: Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna</b> .....	32
	<b>Appendix 3. Indigenous plant species</b> .....	35
	<b>Appendix 4. The New Zealand Threat Classification System</b> .....	37
	<b>Appendix 5. Photographs</b> .....	40

---

**LYTTELTON PORT COMPANY**  
**PROPOSED COAL STOCKYARD EXPANSION**

---

## 1.0 Summary

Lyttelton Port Company Limited (LPC) is proposing to reclaim approximately 10 ha of Te Awaparahi Bay for port activities. It is also possible that part of the Te Awaparahi Bay hillside behind the existing coal stockyard would be excavated to provide additional area of approximately 2 ha. Material for the proposed reclamation would be sourced primarily from LPC's existing Gollan's Bay Quarry, which has been used to supply rock for maintenance and coastal protection work since the early 1950s. As part of the project, LPC plans to upgrade existing quarry access and reinstate the quarry haul road to provide direct access into the port. A portion of the material for the reclamation could come from the hillside excavation at Te Awaparahi Bay, if that is implemented.

This report assesses the potential terrestrial ecological effects associated with the proposal, and was prepared in response to requests for further information under section 92 of RMA by the Christchurch City Council (CCC) and Environment Canterbury (ECan). The assessment entailed a review of existing information, and ecological surveys of the existing quarry and the proposed quarry footprint at Gollan's Bay, the proposed haul road re-alignment, and the reclamation site at Te Awaparahi Bay.

The existing quarry has been highly modified by quarrying activities and consists of near-vertical quarried rock faces, separated by benches that range from relatively flat to steeply-sloping. The vegetation is dominated by exotic grasses and herbaceous species, including a large number of ecological weeds, although the native Banks Peninsula blue tussock (*Festuca actae*), which is endemic to, and common on, Banks Peninsula, is present within and around the quarry.

The vegetation within the proposed quarry footprint, whilst also dominated by exotic species, includes a greater component of native plants; prostrate kowhai and small mounds of *Muehlenbeckia complexa* are reasonably common on the dry grassland and shrubland above the quarry faces, occasional *Coprosma propinqua* and *C. rotundifolia* are present, and the native silver tussock (*Poa cita*) is also present as widespread, scattered individuals.

The vegetation on the slopes above the proposed quarry footprint (and outside the proposal 'footprint') comprises steep-sloping grassland, two nearly contiguous patches of regenerating mixed hardwood forest/shrubland, and an extensive complex of very steep rock bluffs. The grassland is dominated by exotic species, although silver tussock is also present. The north-facing slopes above and to the east of the existing quarry, within the proposed quarry footprint, provide potentially suitable habitat for four endangered plants, and it is possible, although unlikely, that some of these species are present within the proposed quarry footprint.

The vegetation adjacent to the proposed haul road alignment, is dominated by exotic grasses and weeds, and has low ecological value, apart from one small bluff, which supports regenerating native trees and shrubs.

The vegetation on the slopes above the existing coal yard at Te Awaparahi Bay and below Sumner Road comprises mainly common native trees and shrubs (planted by LPC in the 1960s and 1970s) interspersed with exotic grasslands and exotic trees and shrubs. Within the existing coal stockyards at Te Awaparahi Bay, vegetation is essentially absent, apart from a few scattered weeds.

None of the sites within the proposal footprint contain significant indigenous vegetation under the definition or criteria in the Bank Peninsula District Plan.

The vegetation and bluffs above the proposed quarry footprint provide a small area of suitable breeding and/or feeding habitat for indigenous birds such as bellbirds, fantails, silvereyes, and grey warblers.

The widespread and common McCann's skink and common skink are almost certainly present in vegetated and rocky areas throughout the existing and proposed quarry, and environs. The threatened Canterbury gecko is also likely to be present within rocky talus slopes. The shrubland and bluffs above the proposed quarry footprint (outside the proposal footprint) are likely to support Canterbury geckos and, possibly, jewelled geckos (threatened).

We have recommended that the batter slopes associated with the widening of the haul road be re-vegetated with non-weedy species. A small bluff above the haul road supports some indigenous vegetation, and we recommend that the road re-alignment should avoid disturbing this bluff.

If the excavation into the slope behind the coal yard at Te Awaparahi Bay proceeds, a portion of the LPC plantings, within land zoned for Port purposes, from the 1960s and 1970s will be removed. LPC are however proposing to plant an adjoining area below Sumner Road.

The existing coal yard and the seawall that will be affected by the reclamation site have essentially no ecological values and we conclude that no mitigation is necessary at this site.

The proposal will have little or no effect on native birds because the proposal footprint provides little suitable habitat for native birds. In the long term, native birds are likely to benefit from the re-vegetation and targeted weed control that we have recommended. We do not consider that any specific mitigation or monitoring in relation to birds is necessary.

Whilst direct, localised effects of quarrying activities on lizards are unavoidable, these effects are unlikely to have a long-term effect on local lizard populations. In the long term, once quarrying ceases at any given site, the quarry site is likely to provide more extensive rocky habitat than at present, and this will provide suitable habitat for lizards. We do not consider that any specific mitigation or monitoring in relation to lizards is necessary.

The main impacts of the proposal will be the unavoidable physical loss of vegetation and the facilitation of weed colonisation at the quarry and consequent weed spread into surrounding vegetation. We recommend that these effects should be addressed by a programme of re-vegetation with 'non-weedy' species (native and exotic) within the quarried areas, and targeted weed control within and beyond the quarry. It is possible, although unlikely, that some of the eastern slopes within the proposed footprint could provide habitat for some threatened plants.

Overall, we conclude that, whilst accelerated quarrying will have some adverse effects on ecological values within and adjacent to the proposal footprint, implementation of the recommendations set out in this report will mitigate these adverse effects, and thereby retain the ecological values within most of the proposal footprint, and also in those areas above the quarry footprint.

## **2.0 Introduction**

Lyttelton Port Company Limited (LPC) is proposing to reclaim approximately 10 ha of Te Awaparahi Bay for port activities. It is also possible that part of the Te Awaparahi Bay hillside behind the existing coal stockyard would be excavated to provide additional area of approximately 2 ha. This would enable expansion of LPC's existing coal storage facilities at Lyttelton Port, to cater for increased coal throughputs<sup>1</sup>. The proposed site and environs are shown in Figure 1. The additional space would accommodate a projected long-term increase in coal from West Coast mines, including Pike River Coal Ltd.

The existing coal stockyard is located between Cashin Quay breakwater and Battery Point in Lyttelton Harbour. The coal stockyard has been in operation since 1976. Its existing operational area is approximately 10.2 ha and of this, approximately 4.4 ha is for coal stockpiling, with the balance used for offices and amenities, ancillary equipment and activities such as conveyor systems, roading, rail tracks, and mobile plant parking.

Material for the proposed reclamation would be sourced primarily from LPC's existing Gollan's Bay Quarry. Gollan's Bay Quarry has been used to supply rock for maintenance and coastal protection work since the early 1950s. The quarry was a key source of material for the construction of Cashin Quay from 1958 - 1964. As part of the project, LPC plans to upgrade the existing quarry access and reinstate the quarry haul road to provide direct access into the port. A portion of the material for the reclamation could come from the hillside excavation at Te Awaparahi Bay, if that is implemented.

The reclamation may be constructed in stages, with the first stage being approximately 3.3 ha. The final design and staging would be decided following the completion of further feasibility studies.

---

<sup>1</sup> If the reclaimed area is not used for coal storage facilities, it will be used for other activities associated with the Port.

## 2.1 Purpose and scope

The purpose of this document is to provide an assessment of the potential terrestrial ecological effects associated with the proposal. This assessment was prepared in response to requests for further information under section 92 of RMA by the Christchurch City Council (CCC) and Environment Canterbury (ECan). Boffa Miskell Ltd was commissioned by Lyttelton Port Company (LPC) to:

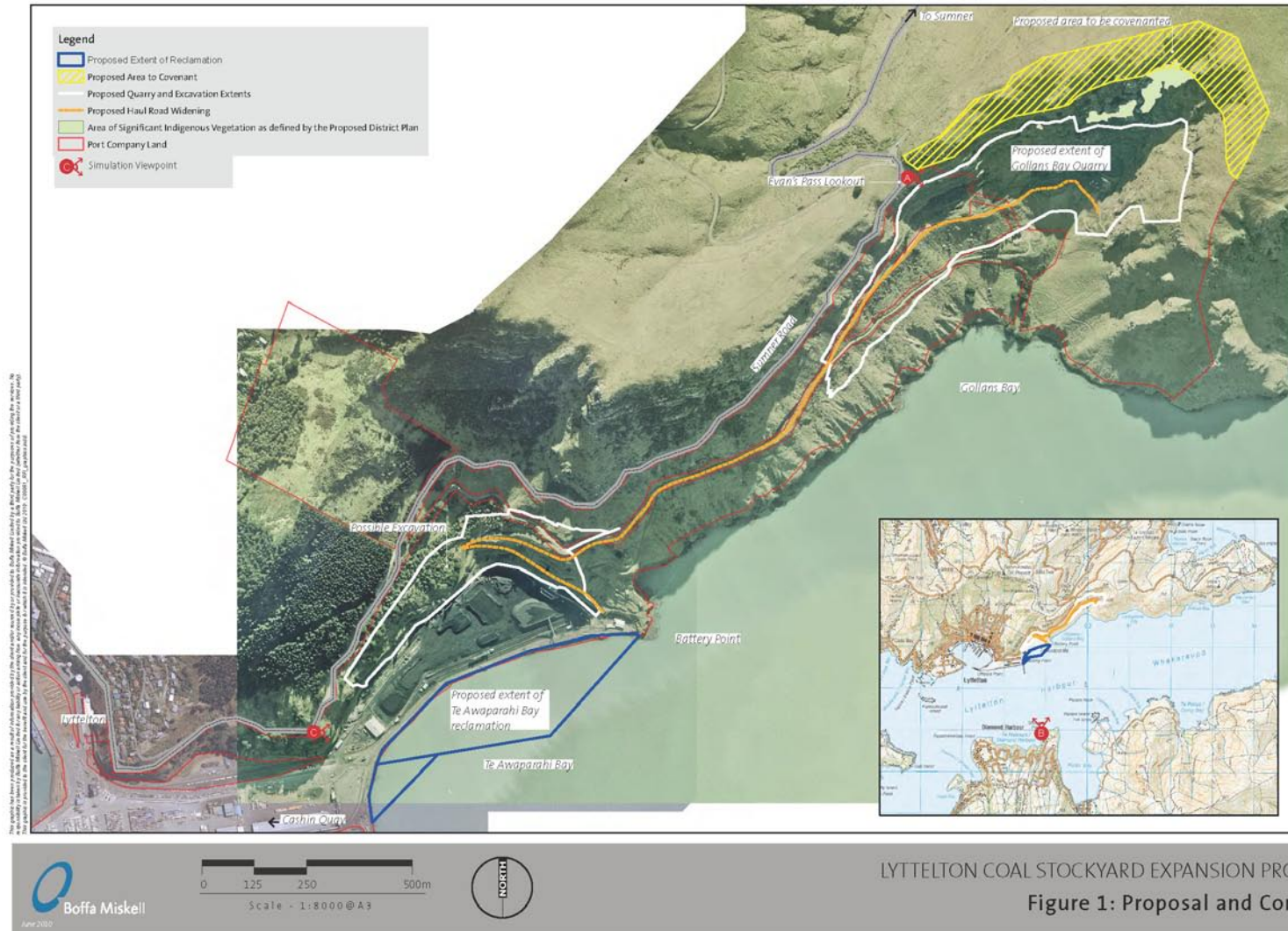
- Describe the terrestrial ecological values of the proposed project 'footprint'.
- Assess the significance of the terrestrial ecological values within the proposed project footprint, according to the definition of significant indigenous vegetation in Part VII of the Proposed Banks Peninsula District Plan (BPDP)<sup>1</sup> (reproduced in Appendix 1).
- Assess the significance of the terrestrial ecological values within the proposed project footprint, according to the criteria set out in Part B of Method 1 (Chapter 19) of the BPDP<sup>1</sup> (Appendix 2).
- Identify and assess the potential effects of the proposal, as set out in the Assessment of Environmental Effects (AEE)<sup>2</sup>, on these ecological values.
- Where potential adverse effects are identified, recommend ways to avoid, remedy or mitigate such effects.
- Determine whether ongoing monitoring is required, and, if so, recommend appropriate monitoring.

---

<sup>1</sup> As set out in Environment Court Decision 45/2008.

<sup>2</sup> Lyttelton Port Company - Proposed Coal Stockyard Expansion, Te Awaparahi Bay. Application for Resource Consent and Assessment of Environmental Effects. July 2009.

**LYTTELTON PORT COMPANY  
PROPOSED COAL STOCKYARD EXPANSION**



**Figure 1.** Aerial view of the proposed site and environs.

## **3.0 Methods**

### **3.1 Review of existing information**

Existing information on the terrestrial plant, lizard and bird communities within the proposal footprint and environs was collated and reviewed. Key sources of general information included the Banks Peninsula Protected Natural Areas (PNA) Programme Survey Report (Wilson 1992), and the recently-published Natural History of Banks Peninsula (Wilson 2009).

Specific, detailed information on botanical values of the Gollan's Bay quarry site and environs, the haul road, and Te Awaparahi Bay is contained within two botanical reports previously commissioned by LPC to inform the consent process. These reports, by Ford *et al.* (2007) and Ford (2009) provided up to date descriptions of plant communities in the vicinity of the project footprint.

### **3.2 Field surveys**

Brief visits were made on 26/10/2008 and 24/03/2010 to gain an understanding of the nature and extent of the proposed quarrying operations; to gain familiarity with the site, and to make a preliminary assessment of likely ecological issues that would require further investigation. On 19 April 2010, a botanical survey was carried out by Mark Sanders (Boffa Miskell Ltd.) and Carol Jensen (consultant botanist) to assess the plant communities within and adjacent to the proposed quarry footprint at Gollan's Bay, paying particular attention to the vegetation along the boundary between the proposed quarry footprint and bluffs above. The vegetation along the proposed haul road alignment and the within the proposed Te Awaparahi Bay reclamation site was also surveyed (the latter site on 26 May 2010).

During site visits, a record was made of birds and lizards present within or near the proposal footprint, and the suitability of the various sites and adjacent areas as bird and lizard habitat was assessed.

### **3.3 Significance Assessment**

#### **ACCORDING TO THE BPDP DEFINITION**

The significance of indigenous vegetation and habitats of indigenous fauna was assessed according to the definition of significant indigenous vegetation in Part VII of the Proposed Banks Peninsula District Plan (BPDP)<sup>1</sup>, and reproduced in

---

<sup>1</sup> As set out in Environment Court Decision C45/2008.

Appendix 1 of this document. The BPDP, at Method 1 Part A, (Chapter 19 - Rural Zone), requires that this definition is to be used '*as an interim regulatory method for addressing the significant indigenous vegetation and significant habitats of indigenous fauna requirements of the Resource Management Act.*'

#### **ACCORDING TO THE BPDP CRITERIA**

The BPDP, in Part B of Method 1 (Chapter 19 – Rural Zone), also states that the Council intends to complete a study to identify significant indigenous vegetation and significant habitats of indigenous fauna, within five years of provision being provided by the Environment Court. The BPDP specifies criteria for making this assessment, but the study has not yet been completed. We include in this report a preliminary assessment of the proposal footprint and environs, according to the criteria in the BPDP<sup>1</sup>, which include:

Ecological values:

- Representativeness
- Rarity
- Distinctiveness

Ecological context:

- Size, shape, buffering, connectivity and linkages.

These criteria and explanatory notes are reproduced in their entirety in Appendix 2 of this report. The purpose of the criteria is to develop a list of significant sites within the Banks Peninsula District. This will require a district-wide approach, in order to assess the various sites against each other, and evaluate them within the context of the district as a whole.

---

<sup>1</sup> As set out in Environment Court Decision C45/2008, and reproduced in Appendix 2.

## 4.0 Description of the Existing Environment

### 4.1 Site overview

#### PHYSICAL ENVIRONMENT

Lyttelton Harbour occupies the eroded caldera remnant of an extinct volcano, the older of two interlocking volcanoes that form Banks Peninsula. The surrounding hills are comprised of basalt bedrock derived from a sequence of lava flows laid down during the growth of the Lyttelton volcano approximately 11 million years ago.

The topography of the area is dominated by the harbour and the Port Hills. The terrain rises steeply from the harbour to a height of approximately 300 metres above sea level on the summit ridge above the Gollan's Bay quarry. The Lyttelton area, including the proposed reclamation site occupies the steep and generally 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 landform and skyline.

Te Awaparahi Bay is located on the northern side of the Lyttelton Harbour, to the east of Lyttelton Township (Figure 1). Gollan's Bay quarry occupies the slopes below and to the east of the highest point of Sumner Road (i.e. Evans Pass).

Te Awaparahi Bay and the coal stockyard are highly modified, mostly occupying earlier reclaimed land; the entire area is now used for coal stockpiling and coal handling infrastructure. The toe of the slopes behind the coal storage area has also been modified with terracing from previous excavations for reclamation work. The existing coal stockyard occupies an area of approximately 10.2 ha of which approximately 4.4 ha is used for coal stockpiling, and the balance for conveyors, roads, rail tracks, parking for mobile plant, and other equipment.

No permanent streams or natural water bodies are present within the proposal footprint, although numerous gullies dissect the site at various points, and these carry surface water during periods of rain. Runoff from Sumner Road and slopes above is discharged to the site at several locations. A sedimentation pond is present at the eastern end of the coal yard, and a small ephemeral, artificial pond has been formed at the base of the existing Gollan's Bay quarry. This pond was dry at the time of our site visits.

#### VEGETATION

Prior to clearance by Europeans, most of Banks Peninsula, including the proposal footprint, probably would have been forested (Wilson 2009). Much of the exposed rock would have been shaded by forest, although the higher rocky bluffs were likely to be exposed. The present vegetation community is largely induced and dominated by exotic grasses, although remnants of original vegetation communities persist and

are regenerating. In general, rocky outcrops and bluffs on Banks Peninsula can provide refugia from grazing and fire, and provide valuable habitat for indigenous flora and fauna. Some small rock outcrops occur within the proposed quarry footprint but the most extensive bluffs are located on the slopes above and outside the quarry footprint proposed in the application.

The vegetation on the slopes above the proposed quarry footprint comprises steep-sloping grassland, with patches of regenerating indigenous shrub and tree species amongst the grassland and the extensive complex of very steep rock bluffs (Photo 1). The grassland is dominated by exotic grasses including cocksfoot (*Dactylis glomerata*), browntop (*Agrostis capillaris*), sweet vernal (*Anthoxanthum odoratum*) and Yorkshire fog (*Holcus lanatus*). The native silver tussock (*Poa cita*) is also present as widespread, scattered individuals. The vegetation within the bluffs includes two nearly contiguous patches of mixed hardwood forest/shrubland<sup>1</sup>, with a combined area of approximately 1.5 ha (Figure 1; Photo 2).

The bluffs and grassland above the proposed quarry footprint provide good habitat for a range of native species. Although not seen on this survey, a suite of rare plants occupy similar habitats and are known from nearby sites on the Port Hills. These include the blanket fern (*Pleurosorus rutifolius*), annual fern (*Anogramma leptophylla*), Banks Peninsula forget-me-not (*Myosotis australis* var. *lytteltonensis*) and native carrot (*Daucus glochidiatus*). Because these species tend to have dried up by autumn, a survey during spring, when they are more likely to be visible, would be required to confirm whether these species are present.

Appendix 3 lists all indigenous plant species recorded above and within the proposed quarry footprint in the surveys of 19 April 2010, 24 June 2007 (Ford 2007), and 15 October 2008 (Ford *et al.* 2008).

## **4.2 Gollan's Bay quarry and environs**

### **VEGETATION OF PROPOSED QUARRY FOOTPRINT**

Within the proposed quarry footprint, the vegetation is dominated by exotic grassland similar to that on the slopes above the proposed quarry footprint,

---

<sup>1</sup> Prominent species include ngaio (*Myoporum laetum*), lemonwood (*Pittosporum eugenoides*), kohuhu (*Pittosporum tenuifolium*), mahoe (*Melicactus ramiflorus*), lacebark (*Hoheria angustifolia*), broadleaf (*Griselinia littoralis*), golden akeake (*Olearia paniculata*), fivefinger (*Pseudopanax arboreus*), native broom (*Carmichaelia australis*), harakeke (New Zealand 'flax'; *Phormium tenax*), cabbage tree (*Cordyline australis*), kowhai (*Sophora prostrata*), the climbing shrub *Muehlenbeckia complexa*, and five *Coprosma* species.

described above. Prostrate kowhai and small mounds of *Muehlenbeckia complexa* are reasonably common on the dry grassland and shrubland above the quarry faces. The occasional *Coprosma propinqua* and *C. rotundifolia* is present. Some exposed rock is present, but this is much less extensive than on the slopes above the proposed quarry footprint.

The Banks Peninsula blue tussock (*Festuca actae*) occurs only on Banks Peninsula, where it is 'abundant to common and widespread' Wilson (2009). This species was recorded at a few sites on shady rock outcrops within the existing quarry and proposed quarry footprint, and on the slopes above, but its distribution and abundance were not surveyed in detail. Because it is restricted to Banks Peninsula, *F. actae* has a threat ranking of 'At Risk: Naturally Uncommon (One Location)' (de Lange *et al.*, 2009).

#### **VEGETATION WITHIN THE EXISTING QUARRY**

The existing quarry consists of near-vertical quarried rock faces, separated by benches that range from relatively flat to steeply-sloping (Photo 3). The vegetation is dominated by exotic species, including a large number of weed species. Because native plants tend to be relatively slow colonisers, suitable habitat on the benches and quarry faces (e.g. rock crevices) is typically occupied first by weed species, following disturbance due to quarrying. On the north-westerly facing slopes, weeds include spur valerian (*Centranthus ruber*), common polypody (*Polypodium vulgare*), pig's ear (*Cotyledon orbiculata*), and boneseed (*Chrysanthemoides monilifera*)<sup>1</sup>.

Few native plants are present within the existing quarry, although, as mentioned above, the Banks Peninsula blue tussock is present within the existing quarry. The south-facing quarry faces are less vegetated than the north-westerly facing slopes. Little vegetation has managed to colonise the faces; a few exotic grasses, and the occasional silver tussock (*Poa cita*) and koromiko (*Hebe salicifolia*) are present. The invasive introduced common polypody is reasonably common, occupying habitat that might otherwise have eventually supported native species. On the benches, exotic grasses and weeds dominate. Weedy species include spur valerian, pampas grass (*Cortaderia selloana*) and Pride of Madeira (*Echium candicans*).

#### **BIRDS**

Few birds were seen during our visits to the Gollans Bay quarry and environs, although a bellbird was heard. However, the vegetation and bluffs above the proposed quarry footprint provide a reasonable area of suitable breeding and/or

---

<sup>1</sup> One plant at E2490281 N5734731.

feeding habitat for indigenous birds, albeit much smaller than other nearby areas on the Port Hills (e.g. the various reserves mentioned above). The indigenous birds most likely to be found within and around the proposed and existing quarry sites are bellbirds, fantails, silvereyes, and grey warblers.

## LIZARDS

The following five lizard species have been confirmed as present on Banks Peninsula (Lettink, 2009; Wilson 2009). The threatened status of each species is listed following Hitchmough *et al.* (2007)<sup>1</sup>.

- McCann's skink (*Oligosoma maccanni*) (Not Threatened)
- Common skink (*Oligosoma polychroma*) (Not Threatened)
- Canterbury gecko (*Hoplodactylus* "Canterbury") (Threatened: Gradual Decline (Human Induced))
- Jewelled gecko (*Naultinus gemmeus*) (Threatened: Gradual Decline (Human Induced))
- Spotted skink (*Oligosoma* aff. *lineocellatum* "Central Canterbury") (Threatened: Nationally Endangered (Human Induced) – the most threatened on Banks Peninsula)

The forest gecko (*Hoplodactylus granulatus*) (Threatened: Gradual Decline (Data Poor, Human Induced)) may also be present on Banks Peninsula, but this has not yet been confirmed (Lettink 2009).

No lizards were seen during our site visits, but this is not surprising given that visits were undertaken on relatively cool days, and at times of year when lizards were unlikely to be very active. However, the widespread and common McCann's skink and common skink are almost certainly present in vegetated and rocky areas throughout the existing and proposed quarry, and environs. The Canterbury gecko is also likely to be present within areas of rocky talus. The shrubland and bluffs above the proposed quarry footprint are likely to support Canterbury geckos and, possibly, jewelled geckos.

### 4.3 The proposed haul road alignment

The vegetation adjacent to the existing haul road (Photo 4), and thus the main part of the proposed alignment, is dominated by exotic grasses and weeds, including

---

<sup>1</sup> These are the most recent lizard threat classifications and follow the 'old' classification system of Molloy *et al.* (2002). Updated lizard classifications, using the revised threat classification system of Townsend *et al.* (2008), have not yet been published.

spur valerian and old mans beard (*Clematis vitalba*). A small rock bluff immediately above the road supports a remnant/regenerating native plant community, including broadleaf (*Griselinia littoralis*), golden akeake (*Olearia paniculata*), harakeke (New Zealand 'flax'; *Phormium tenax*), and mikimiki (*Coprosma propinqua*).

#### 4.4 Te Awaparahi Bay

The vegetation on the slopes above the existing coal yard at Te Awaparahi Bay and below Sumner Road comprises mainly common native trees and shrubs (planted by LPC in the 1960s and 1970s) interspersed with exotic grasslands (Photo 5). The slopes here are gentler than at the quarry site, and there is very little in the way of natural rock that might support remnant threatened or rare native plant species. Indigenous species present include *Griselinia littoralis*, *Olearia paniculata*, *Meliccytus ramiflorus*, Ngaio (*Myoporum laetum*), Ake ake (*Dodonaea viscosa*), Cabbage tree (*Cordyline australis*), *Olearia avicenniifolia*, *Hoheria populnea*, *Pittosporum tenuifolium*, *Muehlenbeckia australis*, *Phormium tenax*, Poroporo (*Solanum laciniatum*), Kowhai (*Sophora microphylla*).

Introduced species present include pride of Madeira, tree lucerne (*Chamaecytisus palmensis*), sycamore (*Acer pseudoplatanus*), brier (*Rosa rubiginosa*), Tasmanian ngaio (*Myoporum insulare*), *Cupressus* sp., *Pinus* sp., and pampas grass.

However, as noted by Ford *et al.* (2007), a number of indigenous species at this site are not of local provenance, and are not indigenous to the area. Ford *et al.* (2007) listed examples of non-local plants found here as *Hebe parviflora*, *Olearia lineata* cultivar Dartonii, *Phormium tenax* (variegated cultivar), *Pittosporum ralphii*, and *Podocarpus acutifolius*. Another non-local plant at this site is *H. populnea*. Ford *et al.* (2007) also commented that '*it is likely that more species at [this site] are also of ex-Canterbury provenance, but less easy to detect, e.g., Sophora microphylla (kowhai) at this site is a strong candidate*'.

The vegetation above Te Awaparahi Bay provides suitable habitat for common native birds such as bellbird, fantail, silvereye, and grey warbler.

Within the existing coal stockyards at Te Awaparahi Bay (Photo 6), vegetation is essentially absent, apart from a few scattered weeds.

The seawall (Photo 6) provides suitable roosting habitat for seabirds such as gulls, terns and shags. One pied shag and several Southern black-backed gulls were roosting on the rocks during our site visit. Although the local white-flipped penguin (kororā; *Eudyptula minor albosignata*) can be found within Lyttleton harbour, the reclamation site does not provide suitable habitat for this species.

## 5.0 Significance Assessment

### 5.1 Existing quarry – assessment against BPBP definition

The vegetation within the existing quarry is dominated by exotic grasses and weeds, and few native species are present. Vegetation within the existing quarry does not conform to the definition of significant indigenous vegetation under the BPDP, with the exception that the presence of the Banks Peninsula blue tussock (*Festuca actae*), would appear to trigger the following definition of significance in the BPDP, because this species is listed as a threatened species in Appendix III of the BPDP.

“e) *Threatened indigenous plant species*

- i. An area of vegetation which provides a habitat of threatened indigenous plant species found within the Banks Peninsula District as listed in Appendix III or the latest version of the national threatened species listing.”

However, *F. actae* appears to have been listed in error in the BPDP; the BPDP lists *F. actae* as ‘At Risk – Range Restricted’ citing de Lange *et al.* (2004), but this is an incorrect citation. In fact, de Lange *et al.* (2004) listed *F. actae* as ‘Not Threatened’.<sup>1</sup> If this error were corrected, the presence of *F. actae* would not trigger the above definition of significance.

### 5.2 Existing quarry – assessment against BPBP criteria

*Representativeness:* Because the vegetation and physical landscape at the existing quarry is highly modified, it is not at all representative of the indigenous vegetation, habitats, physical features or ecological processes typical of the Port Hills Ecological District.

*Rarity:* The existing quarry does not support indigenous species, habitats, physical features that are threatened nationally or that are rare at the local level. Whilst the locally-endemic *Festuca actae* is present, it is ‘*abundant to common and widespread*’ on Banks Peninsula, including within the Port Hills Ecological District (Wilson 1992, 2009), and is neither threatened nationally nor rare at the local level.

*Distinctiveness:* The vegetation and physical features of the existing quarry are not distinctive in terms of the criteria. The vegetation does not include indigenous

---

<sup>1</sup> We note the rule’s reference to ‘the latest version of the threatened species listing’. Our understanding is that a rule cannot import a later list in this manner, but in any event the latest version of the threatened species listing was prepared under a revised threat classification system that lists *F. actae* as ‘At Risk (naturally uncommon)’ rather than as a threatened species.

species at their distributional limits; levels of endemism are very low (the only local endemic species known from within the quarry is *F. actae*); the quarry is not the type locality for any species (to our knowledge); no relict population is present, and there are no distinctive or atypical natural physical features within the quarry.

*Size, shape, buffering, connectivity and linkages:* The existing quarry is not particularly large and, its shape is of little relevance given its low ecological values. The existing quarry is too modified to provide useful connectivity with, or buffering of, surrounding ecological communities.

Overall, and on the basis of the available information, the vegetation within the existing quarry does not qualify as significant according to the criteria within the BPDP. It is unlikely that a more comprehensive survey of the vegetation of the ecological district as a whole would alter this assessment.

### **5.3 Proposed quarry footprint – assessment against BPBP definition**

The vegetation within the proposed quarry footprint, does not trigger the definition of significant indigenous vegetation in the BPDP, assuming the apparent error regarding *F. actae* (discussed above) is corrected.

It is also possible, although unlikely, that the north-facing aspects above and to the east of the existing quarry, which can be hot and dry in summer, could provide habitat for the endangered native carrot (*Daucus glochidiatus*). The small rock outcrops in this area also provide potential habitat for the endangered blanket fern (*Pleurosorus rutifolius*), annual fern (*Anogramma leptophylla*), and Banks Peninsula forget-me-not (*Myosotis australis* var. *lytteltonensis*). If any of these species were present, the proposed quarry footprint would conform to the definition of significance set out in the BPDP under clause (e) as ‘an area of vegetation providing habitat for threatened indigenous plant species...’

However, these four species are sparsely-distributed on the Port Hills and are therefore unlikely to be present within the relatively small area (approximately 2.6 ha) of suitable habitat within the proposed quarry footprint. Because these species tend to have dried up by autumn, it would be necessary to undertake a thorough survey during spring, when they are more apparent, to confirm whether any were present within the proposed quarry footprint.

### **5.4 Proposed quarry footprint – assessment against BPBP criteria**

*Representativeness:* The vegetation of the proposed quarry footprint is dominated by exotic species, and, whilst containing some indigenous species, is not

representative of indigenous plant communities of similar habitats on Banks Peninsula. Nor does this site contain habitats, physical features or ecological processes that are representative of indigenous ecosystems of the Port Hills Ecological District.

*Rarity:* As described above, the parts of the proposed quarry footprint above and to the east of the existing quarry provide some potential habitat for four endangered plants. Whilst it is unlikely that these species are present within the proposed quarry footprint, a further survey during spring would be necessary to confirm this. Thus, it is possible, but unlikely, that the proposed quarry footprint would satisfy the rarity criterion for significance. Although *F. actae* is present, it is common on Banks peninsula, and does not satisfy the rarity criterion, as discussed above.

*Distinctiveness:* The vegetation and physical features of the proposed quarry footprint are not distinctive. The vegetation does not include indigenous species at their distributional limits; levels of endemism are very low (the only local endemic species confirmed to be present is *F. actae*); the proposed quarry footprint is not the type locality for any species (to our knowledge); no relict population is present, and there are no distinctive or atypical natural physical features at this site.

*Size, shape, buffering, connectivity and linkages:* The proposed quarry footprint above and to the east of the existing quarry is small and is not significant in terms of shape or size. These parts of the proposed footprint do have some value in that they provide a partial buffer between the infestations of ecological weeds in the existing quarry, and the high-value bluffs and vegetation of the slopes above the proposed footprint.

Overall, and on the basis of the available information, the vegetation of the proposed quarry footprint does not satisfy the criteria for significance in the BPDP. It is possible but unlikely that some of four endangered plants could be present at this site. If they were present, the proposed quarry footprint might trigger the significance criteria set out in the BPDP.

## **5.5 Slopes above the proposed quarry footprint**

Although outside the proposed quarry footprint, the vegetation of the bluffs and slopes above the quarry is potentially indirectly affected by quarrying activities (as discussed in Section 6.0). The mixed hardwood forest comprises significant indigenous vegetation according to clauses a) viii and a) ix of the BPDP definition (as shown on Figure 1), and although not formally assessed it may also satisfy the criteria for significance set out in the BPDP. The vegetation amongst the bluffs, beyond the mixed hardwood forest shown in Figure 1, also contains an ecologically valuable indigenous component, but has not been formally assessed against the significance definition or criteria.

## **5.6 The proposed haul road alignment**

The vegetation along the proposed alignment is dominated by exotic grasses and weeds, and does not satisfy any of the definitions or criteria for significance under the BPDP.

## **5.7 Te Awaparahi Bay**

Because the vegetation at Te Awaparahi Bay falls within the Lyttelton Port Zone, the rule and the associated definitions and criteria in the BPDP relating to significant indigenous vegetation do not apply<sup>1</sup>.

---

<sup>1</sup> As advised by Andrew Purves Planning and Resource Management Ltd.

## 6.0 Assessment of Effects

### 6.1 Gollans Bay quarry and environs

#### REMOVAL OF SOIL AND VEGETATION

On-going and accelerated quarrying activities will entail mechanical removal of soil and vegetation within the existing and proposed quarry. These activities inevitably will result in the removal of existing plant communities, although, even in the absence of any active re-vegetation, some native and many exotic species can be expected to re-colonise. Although exotic grasses can be expected to dominate, it is likely that the native Banks Peninsula blue tussock (*F. actae*) would also re-colonise where suitable habitat was available, given that it is locally common, and already present within the existing quarry footprint.

The proposed quarry footprint contains small areas of habitat that appear suitable for four endangered species, as described in Section 4.0. Whilst it is unlikely that these species are present within the site, this potential habitat would be lost as a result of quarrying.

#### WEED INVASION

The extensive disturbance associated with quarrying will facilitate and exacerbate the colonisation and spread of exotic plant species, including various ecological weeds, once active quarrying ceases. Because weeds invade rapidly, they will tend to occupy disturbed substrates within the quarry which might otherwise have been colonised (eventually) by indigenous species. Without active management, high densities of weeds will rapidly establish within newly-disturbed sites within the quarry and consequently provide a source of seeds to the surrounding vegetation. This is evident from the existing vegetation within and adjacent to the existing quarry, which includes a large component of weed species, particularly on previously disturbed substrates.

The worst ecological weeds that have spread on to rock outcrops or talus slopes within and outside the existing quarry are spur valerian, pig's ear and common polypody. Further spread of these species from quarrying would be detrimental to adjacent vegetation communities, particularly the vegetation amongst the bluffs above the proposed quarry footprint. However, whilst quarrying would exacerbate weed spread, many, if not all, of the weed species at the quarry are already present in the area, and will continue to spread, regardless of any future quarry activities, albeit at a slower rate.

The main options for mitigating weed invasion entail re-vegetation with 'non-weedy' species (native and exotic) and targeted weed control, as discussed in Section 7.0, below.

#### **EFFECTS ON LIZARDS**

During the active quarrying phase, quarrying activities will directly affect lizards and their habitats. It is possible that resident lizards will move away from active sites and into the surrounding landscape, but it is also likely that some may be killed as soil and rock is handled. Lizard species most likely to be affected are McCann's skink and common skink which are almost certainly present in vegetated and rocky areas throughout the existing and proposed quarry, and the Canterbury gecko, which is likely to be present within rocky talus slopes.

Whilst direct effects of quarrying activities on lizards are unavoidable, these effects are unlikely to have any long-term effect on local lizard populations, given that the area of quarrying at any given time will be small in relation to the surrounding area of suitable lizard habitat, such as the good quality habitat within the bluffs and slopes above the proposed quarry footprint. Note that only part of the proposed quarry footprint will be actively quarried at any given time.

In the long term, once quarrying ceases at any given site, the quarry site is likely to provide more extensive rocky habitats than at present, and these will provide suitable habitat for the above species, particularly the Canterbury gecko.

## **6.2 The proposed haul road alignment**

The re-alignment and widening of part of the haul road will result in the loss of a narrow strip of predominantly exotic vegetation from the existing roadside, and some temporary disturbance during road construction. Within Te Awaparahi Bay, the re-alignment will entail more substantial excavations on steeper slopes, and therefore disturbance of a larger area of mainly exotic vegetation. Given the predominance of exotic plants species, including various weeds, along the existing haul road, there is little scope for any adverse effects associated with the re-alignment. The disturbance associated with road construction will create an opportunity for weeds to colonise, although, as mentioned, the road alignment is already very weedy.

### 6.3 Te Awaparahi Bay

If the excavation into the slope behind the coalyard at Te Awaparahi Bay proceeds, approximately 2 ha of the LPC plantings that date from the 1960s and 1970s, and the potential habitat they provide for native fauna, will be lost. These plantings are not of particularly high ecological value, because they comprise common, easily-grown species, and include some species from non-local and exotic sources. Nevertheless, they are now in the order of 40 years old, and do contribute to local ecological values, including by providing habitat for indigenous fauna.

The effects on the terrestrial environment at the Te Awaparahi Bay reclamation site will be limited to the incorporation of the existing seawall into the reclamation site, and its replacement with a structure of similar size and substrate along the new seaward edge of the reclamation site. The seawall is not a significant or valuable habitat for seabirds. Given that the seawall supports essentially no terrestrial ecological values, and will, in any case, be replaced by a similar structure once the reclamation is complete, we conclude that the reclamation will have no adverse effects on terrestrial ecological values within the reclamation site.

## 7.0 Proposed mitigation and monitoring

### 7.1 Gollans Bay quarry and environs

As discussed above, the main impacts of the proposal will be the unavoidable physical loss of vegetation and potential habitat of some threatened plants at the quarry site, and the facilitation of weed colonisation at the quarry and consequent weed spread into surrounding vegetation. We recommend that these effects are addressed by a programme of re-vegetation with ‘non-weedy’ species (native and exotic) within the quarried areas, and targeted weed control within and beyond the quarry.

We recommend that re-vegetation should be undertaken within the quarry as rapidly as possible following completion of quarrying activities at any given site, with the principle aim of suppressing weed invasion. To this end, exotic and native grasses (e.g. *Festuca actae* and *Poa cita*) could be used in the first instance, because these can rapidly establish cover and reduce opportunities for weed invasion. Rapidly-growing species of native shrubs and trees that are already present at this site (Appendix 3) should also be planted in places, where practicable, to assist in suppressing weeds and maintaining local ecological values.

We also recommend that an ongoing programme of ecological weed control is established as soon as quarrying commences. The first priority should be early detection and elimination of new weed invasions, because this dramatically reduces both the risk of further spread, and the amount of control effort required. Weed control should extend to the area surrounding the quarry, particularly the bluffs and slopes above the proposed quarry footprint, in order to avoid the spread of weeds into the indigenous vegetation there.

In addition to directly mitigating the adverse effects of weed invasion, targeted weed control, as recommended, would mitigate the loss of potential habitat for endangered plants within the proposed quarry footprint, by protecting the existing high-quality vegetation and habitat within the bluffs and slopes above the proposed quarry.

As discussed in Section 6.0, various ecological weeds are already present in the Gollan’s Bay area, and it is therefore not possible to precisely quantify the degree to which quarrying exacerbates this existing problem. However, an ongoing programme of targeted weed control should at least mitigate the likely adverse effects of weed invasion on indigenous vegetation adjacent to the quarry, and has the potential to benefit this vegetation by partially addressing existing weed problems.

## **7.2 The proposed haul road alignment**

We recommend that the battered loess slopes along the haul road margins be re-vegetated as soon as practical following construction, with the principle aim of rapidly re-establishing vegetative cover to reduce opportunities for herbaceous weeds to establish. This will also assist in stabilising the slopes, and reducing run-off. Rapidly-growing, 'non-weedy' species, such as exotic grasses, would establish most rapidly, but the inclusion of native plants of local provenance, such as those listed as in Appendix 3, should also be considered.

We recommend that the proposed road alignment should avoid disturbing the small rock bluff immediately above the road, which supports a remnant/regenerating native plant community. We understand LPC proposes to narrow the road at this point, and this would avoid any adverse effects on the bluff vegetation.

## **7.3 Te Awaparahi Bay**

We understand that the existing LPC native plantings above the coal yard at Te Awaparahi Bay that will be lost, will be replaced with a similar or greater area of locally-sourced native plants on adjacent LPC land, and, where practicable, at places on the benches after quarrying is completed. In the long-term, re-establishment of a similar or greater area of local-provenance indigenous plantings will maintain ecological values in the vicinity of Te Awaparahi Bay, by maintaining indigenous vegetation and associated habitat for indigenous fauna.

## **8.0 Conclusions**

The proposal entails disturbance of substrate when re-aligning the haul road, and consequent risk of weed colonisation and spread into the surrounding environment. We have recommended that this risk can be mitigated by rapidly re-establishing non-weedy vegetative cover on fresh batters along the haul road. A small bluff above the haul road supports some indigenous vegetation, and we have recommended that the road re-alignment should avoid disturbing this bluff.

If the excavation into the slope behind the coal yard at Te Awaparahi Bay proceeds, a portion of the LPC plantings from the 1960s and 1970s will be lost. LPC propose to plant locally-sourced indigenous vegetation within places on the benches and in an area adjoining Te Awaparahi Bay where practicable.

The existing coal yard and the seawall that will be affected by the reclamation site have essentially no terrestrial ecological values and we conclude that no mitigation is necessary at this site.

The proposal will have little or no effect on native birds because the proposed quarry footprint provides little suitable habitat for native birds. In the long term, native birds are likely to benefit from the re-vegetation and targeted weed control that we have recommended. We do not consider that any specific mitigation or monitoring in relation to birds is necessary.

Whilst direct, localised effects of quarrying activities on lizards are unavoidable, these effects are unlikely to have a long-term effect on local lizard populations. In the long term, once quarrying ceases at any given site, the quarry site is likely to provide more extensive rocky habitat than at present, and this will provide suitable habitat for lizards. We do not consider that any specific mitigation or monitoring in relation to lizards is necessary.

The main impacts of the proposal will be the unavoidable physical loss of vegetation and potential habitat for threatened plants at the quarry site, and the facilitation of weed colonisation at the quarry and consequent weed spread into some of the surrounding vegetation. We have recommended that these effects should be addressed by a programme of re-vegetation with 'non-weedy' species (native and exotic) in places where practicable within the quarried areas, and targeted weed control within and beyond the quarry.

Overall, we conclude that, whilst accelerated quarrying activities will have some adverse effects on ecological values within and adjacent to the proposal footprint, implementation of the recommendations set out above will mitigate these adverse effects, and retain the ecological values within most of the proposal footprint, and in the adjacent LPC land.

## 9.0 Literature cited

de Lange, P. J.; Norton, D. A. ; Heenan, P.B.; Courtney, S. P.; Molloy, B.P.J.; Ogle, C.C.; Rance, B.D. 2004. Threatened and uncommon plants of New Zealand. *New Zealand Journal of Botany* 42:45-76.

de Lange, P. J.; Norton, D. A. ; Courtney, S. P.; Heenan, P. B.; Barkla, J. W.; Cameron, E. K.; Hitchmough, R.; Townsend, A. J. 2009. Threatened and uncommon plants of New Zealand (2008 revision). *New Zealand Journal of Botany* 47:61-96.

Edgar, E; Connor, H. 2000. *Flora of New Zealand. Volume V: Gramineae*. Electronic edition, Landcare Research. Transcr. A.D. Wilton and I.M.L. Andres. <http://FloraSeries.LandcareResearch.co.nz>. Accessed 3 June 2010.

Ford, K. 2007. *Vegetation survey of Gollans Bay and Te Awaparahi Bay*. LandCare Research Report LC0607/146, prepared for Lyttelton Port of Christchurch, June 2007.

Ford, K.; McNeil, S.; Barringer, J.; 2009. *Vegetation survey of Gollans Bay Quarry*. Research Report LC0809/049, prepared for Lyttelton Port of Christchurch, November 2008.

Hitchmough, R.; Bull, L.; Cromarty, P. (comps) 2007: *New Zealand threat classification system lists - 2005*. Department of Conservation, Wellington. 194 p.

Lettink, M. 2009. *Looking after our local lizards*. Proceedings, Banks Peninsula Biodiversity Workshop, Akaroa, 8 October 2009.

Molloy, J.; Bell, B.; Clout, M.; de Lange, P.; Gibbs, G.; Given, D.; Norton, D.; Smith, N.; Stephens, T. 2002. Classifying species according to threat of extinction. A system for New Zealand. *Threatened species occasional publication* 22. Department of Conservation, Wellington. 26 p.

Townsend, A.J.; de Lange, P.J.; Duffy, C.A.J.; Miskelly, C.M.; Molloy, J.; Norton, D.A. 2008. *New Zealand Threat Classification System Manual*. Science and Technical Publishing, Department of Conservation, Wellington, New Zealand.

Wilson, H. 2009. *Natural History of Banks Peninsula*. Canterbury University Press, Christchurch, New Zealand. 144 p.

## Appendix 1. Definition of Significant Indigenous Vegetation

The following text is reproduced (including footnotes) from Part VII (i.e. Definitions) of The Proposed Banks Peninsula District Plan, as set out in Environment Court Decision 45/2008.

Significant Indigenous Vegetation: Means indigenous (native) trees, forest, scrub, tussock grassland, coastal vegetation, wetland and saltmarsh and other indigenous vegetation in any of the following forms:

### a) Indigenous trees, forest and scrub

- i. Any old-growth podocarp/hardwood forest or beech forest which contains *Dacrycarpus dacrydioides* (kahikatea), *Podocarpus totara* (totara), *P hallii* (totara) *Prumnopitys taxifolia* (matai), *Prumnopitys ferruginea* (miro), *Libocedrus bidwillii* or *Nothofagus* spp trees; or any mature individual trees of these species.
- ii. A contiguous area of 0.5ha or more of regenerating podocarp/hardwood forest or beech forest or mixed hardwood forest dominated by native trees e.g. *Melicactus ramiflorus* (mahoe), *Pseudopanax arboreus* (fivefinger), *Pittosporum eugenioides* (lemonwood), *Fuchsia excorticata* (fuchsia), *Hoheria angustifolia* (lacebark), *Plagianthus regius* (ribbonwood), *Pennantia corymbosa* (kaikomako), *Sophora microphylla* (kowhai), *Hedycarya arborea* (pigeonwood), *Myoporum laetum* [sic] (ngaio).
- iii. Mature and regenerating kanuka forest (*Kunzea ericoides*) in the Port Hills Ecological District with any individual kanuka plant more than 4m tall and occupying a contiguous area of 0.25 hectares or more.<sup>1</sup>
- iv. Mature and regenerating kanuka forest (*Kunzea ericoides*) in Herbert, Akaroa or Ellesmere Ecological Districts, with any individual kanuka plant more than 6m tall and occupying a contiguous area of 0.5 hectares or more.

---

<sup>1</sup> The height reached by mature kanuka varies across the Peninsula depending on rainfall, aspect, soil type and exposure. In drier areas, significant mature kanuka vegetation may only reach 4m. This is used as the threshold height in the Port Hills Ecological District to ensure that the values of the small patches of kanuka in these drier areas are recognised. However, a 6m threshold and 0.5 hectare area is appropriate for the wetter Ecological Districts. It is acknowledged that this means that large amounts of tall kanuka in the wetter areas will be recognised as significant.

- v. Lower altitude mixed scrub – a contiguous area of 0.5ha or more in which mature specimens of any of the following genera: *Olearia*, *Hebe*, *Pseuciopanax* [sic], *Fuchsia*, *Griselinia*, *Pseudowintera* and *Coprosma* form the dominant cover.
- vi. Subalpine mixed scrub with generally continuous canopy of native species in which mature specimens of any of the following genera: *Dracophyllum*, *Olearia*, *Hebe*, form the dominant cover.
- vii. Lower altitude small-leaved shrubland dominated by small-leaved *Coprosma* species, *Muehlenbeckia complexa*, *Helichrysum lanceolatum*, *Melicytus alpinus*, *Carmichaelia australis* and/or *Discaria toumatou* (matagouri) occupying a contiguous area of 0.1 hectares or more and where canopy cover of all native shrub species exceeds 15%.
- viii. Communities of boulder fields, bluffs and talus slopes (i.e. rock), that have rock cover that is over 40% and 30% or more indigenous vegetation cover that is made up of mosses and lichens and/or any of the following species: *Sophora prostrata*, *Podocarpus hallii*, *Phormium tenax*, *P cookianum*, *Carmichaelia australis*, *Muehlenbeckia complexa*, *Melicytus alpinus*, *Corokia cotoneaster*, *Fuchsia excorticata*, *F perscandens*, *F excorticata* X *perscandens*, *Hebe strictissima*, *H salicifolia*, *Coprosma* spp.
- ix. Mixtures of significant indigenous vegetation types described above, occupying an area of 0.5ha or more.<sup>2</sup>

**b) Indigenous tussock grassland**

- i. Tall tussockland and/or tall tussock shrubland in which native snow tussock (*Chionochloa*) and/or *Dracophyllum* accounts for 15%.<sup>3</sup>
- ii. A contiguous area of short tussockland in which native fescue/hard tussock (*Festuca novae-zelandiae*) and native inter-tussock species accounts for 20% or more of canopy cover.
- iii. A contiguous area of over 1.0 hectare of short tussockland in which native silver tussock (*Poa cifa*) [sic] and native inter-tussock species account for 30% or more of canopy cover.<sup>4</sup>

---

<sup>2</sup> Succession from open shrublands to closed forest cover is occurring on the BP so that the types described in a(i) to a(vii) often merge into each other and can change depending on local environmental conditions and land management practices.

<sup>3</sup> Threshold recognises that this vegetation is very unusual on BP and rarely occurs at densities over 15%.

**c) Indigenous coastal vegetation**

- i. Coastal dunes, interdunes, and foreshore communities, including those with *Desmoschoenus spiralis* (pingao).
- ii. Coastal shrubland communities, such as those at Okains Bay, Lake Forsyth/Wairewa, Birdlings Flat, and on the Kaitorete Barrier/Spit, and those providing habitat and the yellow-eyed penguin.

**d) Indigenous wetland vegetation**

- i. Naturally occurring freshwater marsh, fen, swamp, flush and aquatic vegetation, including closely associated riparian vegetation, in which native species of the following genera are present: *Typha* (raupo), *Cortaderia* (toetoe), *Phormium* (flax), *Carex* (sedges), *Eleocharis* (spike rush), *Potamogeton* (pond weed), *Sphagnum* (sphagnum moss), *Isolepis*, *Schoenus*.
- ii. Saltmarsh vegetation in which any of the following native species are present: *Zostera* (seagrass), *Plagianthus divaricatus* (saltmarsh ribbonwood), *Juncus kraussii* (sea rush), *Apodasmia similis* (jointed rush), *Selliera radicans*, *Samolus repens* (sea primose), *Sarcocornia quinqueflora* (glasswort), *Mimulus repens* (native musk), *Puccinellia distans* (saltmarsh grass), *Schoenoplectus* spp.

**e) Threatened indigenous plant species**

- ii. An area of vegetation which provides a habitat of threatened indigenous plant species found within the Banks Peninsula District as listed in Appendix III or the latest version of the national threatened species listing.

---

<sup>4</sup> The % cover thresholds that are used for short tussock grasslands recognise that native plant cover between the tussocks (inter-tussock) can be an important component of the vegetation type. Silver and fescue tussock can be difficult to distinguish, often form mixes, and vary in density in different parts of the Peninsula due to environmental factors and pastoral management regimes. Fescue tussock is much less common than silver tussock.

## **Appendix 2. Method 1: Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna**

The following text is reproduced (including footnotes) from Chapter 19 (Rural Zone) of The Proposed Banks Peninsula District Plan, as set out in Environment Court Decision 45/2008.

### **Part A:**

To use the definition of significant indigenous vegetation and associated rule as an interim regulatory method for addressing the significant indigenous vegetation and significant habitats of indigenous fauna requirements of the Resource Management Act.

### **Part B:**

To identify (in consultation with landowners and other interested parties) sites of significant indigenous vegetation and significant habitats of indigenous fauna in accordance with a set of criteria below.

Council is committed to undertaking a study to identify significant indigenous vegetation and significant habitats of indigenous fauna. The details of the process by which the sites of significance will be identified will involve:

- Establishment of a broad based community steering group to oversee the study and assist the Council with input and advice. This is intended to ensure, among other things, that the process of identification is well understood and has wide community acceptance.
- Identification of potential sites with S6c values using the criteria included below;
- On the ground assessment of the values of these sites;
- Discussions with landowners on appropriate management mechanisms;
- Evaluation and review of the application of the criteria listed below;

Council intends to complete the study and carry out a section 32 analysis to determine whether any of the areas should be included in the Plan within 5 years of this provision being approved by the Environment Court.

Before deciding on whether any identified area should be included in the District Plan, Council will have regard to all of the following matters as part of its s32 of the RMA analysis:

- Threats or risks to the identified values;

- Other options for ensuring the identified values and their needs are recognised and protected;
- Economic effects on the landowner (e.g. management costs, lost development potential);
- Resources required to implement effective protection;
- Ecological functioning<sup>1</sup>
- The potential benefits of including the site in the Plan (including ecological benefits and benefits for the landowner, such as its use for environmental merit)
- Any other relevant factor;

The criteria will be applied at the Ecological District scale in a way that recognises that the majority of ecosystems on the Banks Peninsula are secondary and/or induced. The importance of the 'commonplace' is central to recognising the full range of biodiversity values.<sup>2</sup>

The criteria should include but not necessarily be limited to:

1. The ecological values of an area or group of areas – the values of the places themselves
  - Representativeness - Supporting indigenous vegetation, habitats, physical features<sup>3</sup> or ecological processes which are typical of their ecological district, including the commonplace.
  - Rarity. - Supporting, or important for the recovery of, an indigenous species, habitat, physical feature, or community of species which is threatened nationally or is rare at a local level (i.e. within the Ecological District).
  - Distinctiveness<sup>4</sup>. - The type and range of unusual features of the area itself including:
    - presence of indigenous species at their distribution limit
    - levels of endemism (eg the presence of endemic species)

---

<sup>1</sup> This matter provides for consideration of the long-term ecological management needs for any site that might be included in the Plan, including the need for a buffer zone.

<sup>2</sup> The focus of the District Plan is on "typical" and not necessarily "original" or "best" vegetation cover or habitats, recognizing that the common/ widespread secondary ecosystems on the Banks Peninsula have ecological values. The commonplace (synonym for common) is a key concept within the criterion of representativeness. The character of an Ecological District is broadly defined by the presence of common ecological features, e.g. second growth forest remnants, silver tussock grasslands and volcanic rock outcrops. The inclusion of common communities and features within significant areas is the main way in which most biodiversity is recognised. This approach is important as it caters for the needs of smaller and inconspicuous biota that are not normally seen. To complement the commonplace, unusual or rare features are catered for by other criteria to ensure that the full range of ecosystems and ecological features are recognised.

<sup>3</sup> "Physical features" provide habitat structure for a number of plants and animals.

<sup>4</sup> Distinctiveness focuses on truly "unusual" features rather than things that are rare or representative.

- the type locality for a plant or animal
  - the occurrence of relict distributions
  - physical features (which provide atypical habitat)
2. The ecological context of the area or a group of areas including the relationship with their surroundings. This recognises that ecological processes affecting indigenous ecosystems extend beyond their obvious physical boundaries, e.g. hydrology, pollination and dispersal.
- Size, shape, buffering connectivity and linkages. The extent to which an area has ecological value due to its configuration, location and ecological functioning in relation to its surroundings.<sup>5</sup>

**Note:** The application of some ecological criteria such as representativeness, rarity and connectivity may not be able to be confirmed until a number of properties have been surveyed in a particular locality and the overall pattern of remnant indigenous vegetation and habitats can be assessed.

---

<sup>5</sup> The combination of size, shape, buffering, and connections to its surroundings all contribute to the ecological value of an area of vegetation or habitat (sometimes called a “patch”). The ecological functioning of an area may be adversely affected by activities in its surroundings (sometimes called the “matrix”). Examples include:

- Large areas often have greater natural diversity, but small areas collectively can have increased value or may be important for invertebrates.
- Compact areas are normally less affected by edge effects.
- Buffers help to reduce external influences such as wind effects on a forest edge, weed invasion, grazing impacts and nutrient pollution.
- Isolated remnants can act as stepping stones between larger remnants.

## Appendix 3. Indigenous plant species

The table below lists indigenous plant species recorded on the slopes above and within the proposed quarry footprint. This list is a compilation of species recorded in the surveys of 19 April 2010 (this report), 24 June 2007 (Ford 2007), and 15 October 2008 (Ford *et al.* 2008). Because the surveys focused on the vegetation above the quarry, this is not a comprehensive list of species within the proposed quarry or quarry footprint.

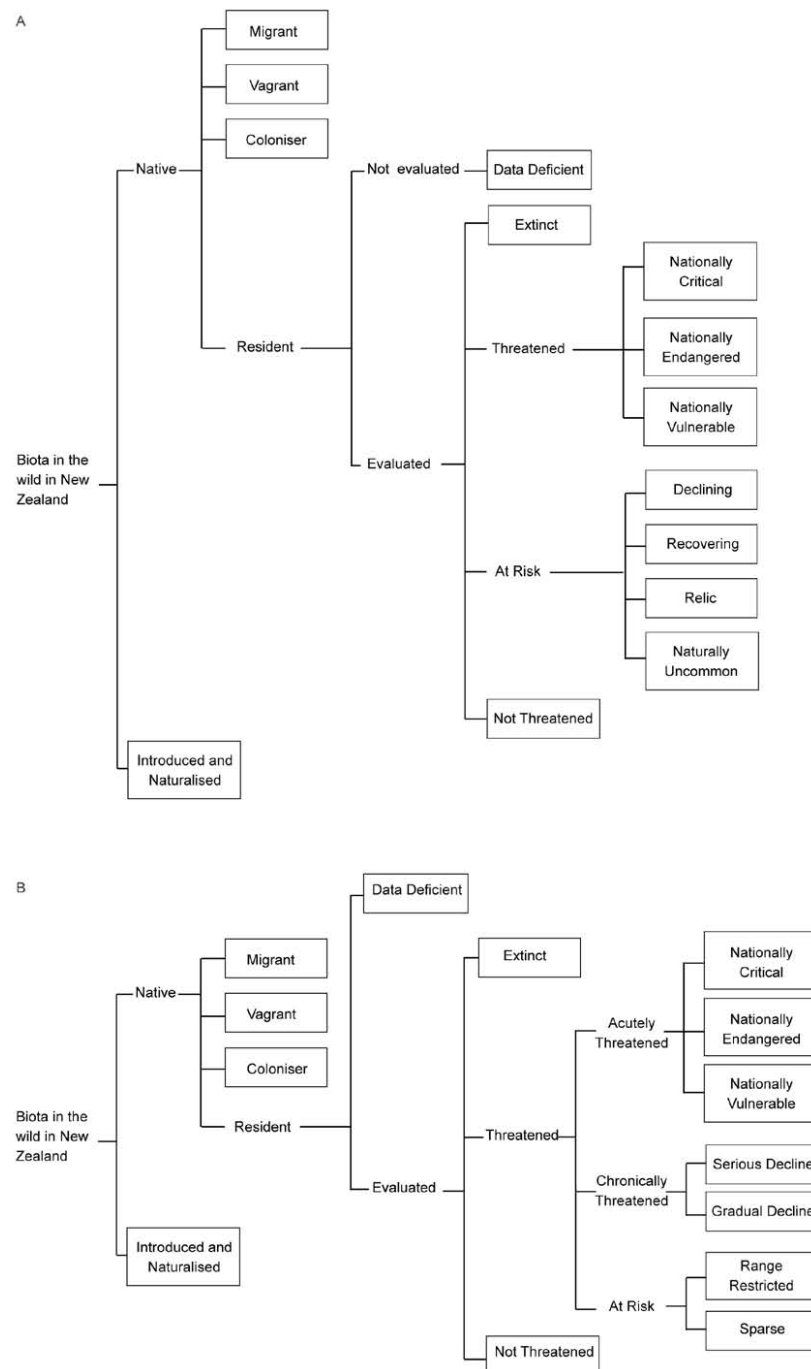
Species name	Slope above proposed quarry footprint	Within proposed quarry footprint
<i>Asplenium oblongifolium</i>	Y	
<i>Asplenium appendiculatum</i>	Y	
<i>Asplenium flabellifolium</i>	Y	Y
<i>Asplenium hookerianum</i>	y	
<i>Brachyglottis lagopus</i>	Y	
<i>Calystegia tuguriorum</i>	Y	
<i>Carmichaelia australis</i>	Y	Y
<i>Cheilanthes sieberi</i>	Y	Y
<i>Clematis foetida</i>	y	
<i>Coprosma crassifolia</i>	Y	
<i>Coprosma propinqua</i>	Y	Y
<i>Coprosma rotundifolia</i>	Y	Y
<i>Coprosma virescens</i>	Y	Y
<i>Coprosma robusta</i>	Y	
<i>Cordyline australis</i>	Y	
<i>Dichelachne crinita</i>	Y	
<i>Dichondra repens</i>	Y	
<i>Echinopogon ovatus</i>	Y	
<i>Festuca actae</i>	Y	Y
<i>Festuca novae-zelandiae</i>	Y	
<i>Griselinia littoralis</i>	y	
<i>Haloragis erecta</i>	Y	
<i>Hebe strictissima</i>	Y	
<i>Helichrysum glomeratum</i>	Y	
<i>Helichrysum lanceolatum</i>	y	
<i>Hoheria angustifolia</i>	Y	
<i>Lachnagrostis lyallii</i>	Y	
<i>Leucopogon fraseri</i>	Y	
<i>Libertia ixioides</i>	Y	
<i>Luzula banksiana var. orina</i>	Y	
<i>Melicytus alpinus</i>	Y	
<i>Melicytus ramiflorus</i>	Y	Y
<i>Micropiper excelsa</i>	Y	
<i>Microlaena polynoda</i>	Y	
<i>Microlaena stipoides</i>		Y
<i>Muehlenbeckia complexa</i>	Y	Y
<i>Microsorium pustulatum</i>	Y	
<i>Myoporum laetum</i>	Y	

**LYTTELTON PORT COMPANY**  
**PROPOSED COAL STOCKYARD EXPANSION**

<i>Olearia paniculata</i>	Y	
<i>Oxalis exilis</i>	Y	
<i>Parsonsia capsularis</i>	Y	
<i>Passiflora tetrandra</i>	Y	
<i>Pellaea rotundifolia</i>	y	
<i>Phormium tenax</i>	y	
<i>Pittosporum eugenoides</i>	Y	
<i>Pittosporum tenuifolium</i>	y	
<i>Poa cita</i>	Y	Y
<i>Poa colensoi</i>	Y	
<i>Poa matthewsii</i>	Y	
<i>Polystichum richardii</i>	Y	
<i>Pseudopanax arboreus</i>	y	
<i>Pteridium esculentum</i>	Y	
<i>Rubus squarrosus</i>	Y	
<i>Scleranthus uniflorus</i>	Y	
<i>Senecio glaucophyllus</i> subsp. <i>basinudus</i>	Y	
<i>Senecio quadridentatus</i>	Y	
<i>Solanum aviculare</i>	Y	
<i>Sophora prostrata</i>	Y	Y
<i>Streblus heterophyllus</i>	Y	
<i>Urtica ferox</i>	y	
<i>Vittadinia australis</i>	Y	
<i>Wahlenbergia gracilis</i>	Y	

## Appendix 4. The New Zealand Threat Classification System

Figure reproduced from the New Zealand Threat Classification System (Townsend *et al.* 2008). A. Revised (2007) and B. original (2002) structure of the New Zealand Threat Classification System.



**APPENDIX 4 continued.** New Zealand Threat Classification System qualifiers

The following is adapted from Townsend *et al*<sup>1</sup> (2008):

Qualifiers are an integral part of the New Zealand Threat Classification System (Townsend *et al.* 2008) and must be cited in publications referring to the threat status of taxa listed under this system. Qualifiers provide critical additional information about a taxon's listing, status and management. When a taxon is listed, all of the qualifiers that apply to it are recorded in alphabetical order as subscripts after the threat category. For example:

*Anzybas carsei* 'Nationally Critical<sub>CD, EF, OL, RF</sub>'

The qualifiers (abbreviations in brackets) and their full definitions are listed below:

**Conservation Dependent (CD)**

The taxon is likely to move to a higher threat category if current management ceases.

**Data Poor (DP)**

Confidence in the listing is low due to there being only poor data available for assessment.

**Designated (De)**

A taxon that does not fit within the criteria provided, and which the Expert Panel has designated to the most appropriate listing without full application of the criteria. For example, a commercial fish stock that is being fished down to Biomass Maximum Sustainable Yield (BMSY) may meet criteria for 'Declining'; however, it could be designated as 'Not Threatened' if the Expert Panel believes that this better describes the taxon's risk of extinction.

**Extinct in the Wild (EW)**

The taxon is known only in cultivation or captivity.

**Extreme Fluctuations (EF)**

The taxon experiences extreme unnatural population fluctuations, or natural fluctuations overlaying human-induced declines, that increase the threat of extinction. When ranking taxa with extreme fluctuations, the lowest number of mature individuals should be used for determining population size, as a precautionary measure.

**Increasing (Inc)**

There is an ongoing or predicted increase of > 10% in the total population, taken over the next 10 years or three generations, whichever is longer. Note that this qualifier is redundant for taxa ranked as 'Recovering'.

**Island Endemic (IE)**

A taxon whose natural distribution is restricted to one island archipelago (e.g. Auckland Islands) and is not part of the North or South Islands or Stewart Island/Rakiura.

**One Location (OL)**

Found at one location (geographically or ecologically distinct area) of less than 1000 km<sup>2</sup> (100 000 ha), in which a single event (e.g. a predator irruption) could easily affect all individuals of the taxon, e.g. L'Esperance Rock groundsel (*Senecio lautus* var. *esperensis*) and Open Bay Island leech (*Hirudobdella antipodum*). Taxa with restricted distributions but where it is unlikely that all sub-populations would be threatened by a single event (e.g. because water gaps within an archipelago are larger than known rodent swimming distances) should be qualified as 'Range Restricted' (RR). 'OL' can apply to all 'Threatened' and 'At Risk' taxa, regardless of whether their restricted distribution is natural or human-induced.

**Partial Decline (PD)**

Taxa undergoing decline over the majority of their range, but with one or more secure populations (such as on offshore islands). Partial decline taxa (e.g. North Island kaka *Nestor meridionalis septentrionalis* and Pacific gecko *Hoplodactylus pacificus*) are declining towards 'Relict' status rather than towards extinction.

**Range Restricted (RR)**

Taxa confined to specific substrates, habitats or geographic areas of less than 1000 km<sup>2</sup> (100 000 ha); this is assessed by taking into account the area of occupied habitat of all sub-populations (and summing the areas of habitat if there is more than one sub-population), e.g. Chatham Island forget-me-not (*Myosotidium hortensia*) and Auckland Island snipe (*Coenocorypha aucklandica aucklandica*). This qualifier can apply to all 'Threatened' and 'At Risk' taxa regardless of whether their restricted distribution is natural or human-induced, but is redundant if a taxon is confined to 'One Location' (OL).

**Recruitment Failure (RF)**

The taxon's current population may appear stable but the age structure is such that catastrophic declines are likely in the future.

**Secure Overseas (SO)**

The taxon is secure in other parts of its natural range outside New Zealand.

**Sparse (Sp)**

Taxa that occur within typically small and widely scattered populations.

**Stable (St)**

The total population is stable ( $\pm 10\%$ ), taken over the last 10 years or three generations, whichever is longer.

**Threatened Overseas (TO)**

The taxon is threatened in those parts of its natural range outside New Zealand.

## Appendix 5. Photographs



Photo 1. Existing quarry in foreground, with steep slopes and bluffs above.



Photo 2. Regenerating mixed hardwood forest/shrubland amongst bluffs above the proposed quarry footprint.



Photo 3. Existing quarry, looking toward Evan's Pass (upper left).



Photo 4. Existing haul road. Note dominance of exotic vegetation.



Photo 5. LPC plantings from 1960s and 1970s, above Te Awaparahi Bay coal yard.



Photo 6. Coal yard at Te Awaparahi Bay, with seawall on left.