

# Kaniere/McKays HEPS

---

## LANDSCAPE REHABILITATION PLAN

DRAFT

*Prepared for*

TrustPower Limited

*By*

Boffa Miskell Limited

DRAFT

## Contents

1. INTRODUCTION .....	1
1.1. Background.....	1
1.2. Location and Context .....	2
1.3. Scope of Landscape Rehabilitation Plan .....	4
2. OBJECTIVES AND PRINCIPLES .....	6
2.1. Objectives of Landscape Rehabilitation .....	6
2.2. Guiding Principles for Landscape Rehabilitation .....	6
2.3. Management and Monitoring Principles .....	7
3. MATTERS CONSIDERED .....	8
3.1. Introduction .....	8
3.2. Ecological Matters.....	8
3.3. Landscape and Amenity Matters.....	9
3.4. Rehabilitation Works between the Intake/Landing Area and Chainage 500m.....	10
3.5. General Programming Matters .....	10
4. SITE PREPARATION .....	12
4.1. Introduction .....	12
4.2. Clearance .....	12
4.3. Earthworks and Drainage.....	14
5. REVEGETATION.....	15
5.1. Introduction.....	15
5.2. Regeneration .....	15
5.3. Indigenous Planting .....	16
5.4. Pasture .....	16
6. CONSTRUCTION AREAS AND VEGETATION TYPES .....	17
6.1. Introduction .....	17
6.2. Re-vegetation Types.....	17
6.3. Kaniere Forks Enhancement.....	18
6.4. McKay's Enhancement .....	20
7. MONITORING AND MANAGEMENT .....	21
7.1. Introduction .....	21
7.2. Success of Rehabilitation.....	21
7.3. Plant Pests .....	24
7.4. Animal Pests.....	26
7.5. Summary .....	27
8. APPENDIX 1: SPECIES LISTS FOR EACH VEGETATION TYPE TO BE PLANTED ..	28



# 1. INTRODUCTION

## 1.1. Background

As part of its consents to enhance, construct and operate the Kaniere Forks and McKays Creek Hydroelectric Power Scheme (KNF/MKY HEPS) TrustPower (TPL) will undertake extensive landscape rehabilitation to remedy and mitigate the effects of construction. Conditions of consent (General Conditions West Coast Regional Council 20 - 22 and Westland District Council 19 -21) for both parts of the project require the preparation of a Landscape Rehabilitation Plan (LRP) to, amongst other things:

*“...provide details as to the rehabilitation and enhancement of the land surface, topsoil, drainage, and vegetation in all disturbed areas”*

This Draft LRP has been prepared to reflect the design and construction for both the Kaniere Forks and McKays Creek parts of the project at the time of the Council Hearing (26 March 2012). After approval of the consents, the draft will be submitted to the Consent Authority two months prior to the commencement of construction, in accordance with condition 12 (WDC General Conditions) and 13 (WCRC General Conditions):

*“At least 2 months prior to commencement of construction of the McKays HEPS Enhancement as authorised by these consents, the Consent Holder shall provide to the Consent Authority the following plans, as prepared and to be executed by a suitably qualified person, in accordance with Conditions 18 to 28:*

- (a) Environmental Management Plan;*
- (b) Landscape Rehabilitation Plan;*
- (c) Contingency and Response Management Plan;*
- (d) Earthworks and Sediment Control Management Plan.”*

The LRP is one of a series of Management Plans<sup>1</sup> relating to the construction programme, and should be read in conjunction with these. The ecological and landscape information on which this plan is based is found in Technical Reports accompanying the consents applications: Terrestrial Ecology and Avifauna Assessment (Boffa Miskell Ltd) and Landscape and Natural Character Assessment (Mary Buckland).

The *Draft* LRP will inform detailed design and construction programming, and the *Final* LRP will guide construction work, landscape rehabilitation and maintenance activities.

---

<sup>1</sup> Construction Environmental Management Plan, Historic Heritage Management Plan, Traffic Management Plan and Construction Noise Management Plan.

In Section 2, the broad objectives and principles for rehabilitation are set out and in Section 3 the range of matters that have been taken into account in preparing the rehabilitation programme are discussed. Section 4 outlines the site preparation activities in relation to ecological and landscape aspects of rehabilitation and Section 5.0 describes the regeneration and planting requirements. Section 6.0 describes preparation and planting requirements for specific places or areas. Section 7 discusses methods for monitoring regeneration success and plant and animal pest control and monitoring.

## 1.2. Location and Context

The KNF and MKY HEPS and proposed construction works are located largely on public conservation land administered by DOC adjacent to Lake Kaniere and the Kaniere River (which flows out of the lake) approximately 20 km east of Hokitika. The area is in the Hokitika Ecological District. The indigenous vegetation of this Ecological District is characterised by areas of dense rimu and kahikatea forests, mixed rimu-hardwood forests, and kahikatea and silver pine swamps but there has been extensive modification (of the alluvial flats in particular) by farming, logging, forestry and impacts of introduced animals as well as diversion and damming of waterways and infrastructural developments.

### *Landscape Character and Values*

Lake Kaniere is located in the South Island of New Zealand, 16km south east of Hokitika, north-west of the main alpine fault that separates the Southern Alps from the West Coast lowlands. The lake is approximately 8km long, 2km wide, and as deep as 195m in places. It drains to the Kaniere River, which runs north west to link with the Hokitika River south of Hokitika. The lake is situated between two prominent massifs composed of granite – Mt Graham (826m high) to the west, and Mt Tuhua (1,125m high) to the east. Both these mountains lie just west of the alpine fault line. Lake Kaniere is a terminal lake impounded between the moraines downstream and Mt Graham and Mt Tuhua upstream.<sup>2</sup>

The lake is surrounded by the Lake Kaniere Scenic Reserve, which stretches from the lake to the tops of the peaks that surround it – Mt Brown, Mt Graham, and Mt Tuhua, and north following the Kaniere River to Butchers Gully. The reserve includes the lake, flanking ranges up to their crests, moraine and outwash terraces to the north, and small recent flats and fans around the lake.<sup>3</sup> It also includes the area between Lake Kaniere Road and the west bank of the Kaniere River north from the lake as far as the bend in the road, half a kilometre south of Butchers Creek. This landscape has high landscape, amenity and natural character values.

To the north of the Scenic Reserve is the Kaniere State Forest.

Further north again, the land has been cleared for farming and forestry and there has been significant landscape disturbance due to roading and farming. A large siphon has been constructed across Green

---

<sup>2</sup> *Landforms - The shaping of New Zealand*. Les Molloy and Roger Smith. Craig Potton Publishing 2002.

<sup>3</sup> *Lands and Survey facts sheet - Lake Kaniere Scenic Reserve No. 29*.

Creek valley, which is part of the existing Kaniere Fork/McKays Creek Scheme. To the north and south of McKays Power Station there are existing pine plantations.

The bush in the Scenic Reserve that surrounds the lake, and on the south side of Kaniere River, varies in quality. At Canoe Cove and in places along Lake Kaniere Road the vegetation consists of high quality dense rimu forest on outwash terraces and gentle moraine. In the flatter areas there are large rimu, kamahi, quintinia, and sparse understorey of celery pine. There are also locally dense rimu pole stands. On the boggy terraces on the south side of Kaniere River there is an understorey of stunted rimu, and kahikatea in places, Halls totara, sphagnum, silver pines, mamaku, and celery pines.

In other parts of the area south of the Kaniere River the land has been logged for silver pine and is now regenerating. There are scattered remnant rimu and silver pine. Parts of these previously logged areas have a disturbed appearance.

Due east of the Lake Kaniere intake, and around Canoe Cove, is a large area of dense rimu forest of high quality. This good quality vegetation including rimu, kamahi, tawherowhero and toatoa, amongst others, also occurs along the existing water race, around the intake at The Landing, and downstream of Ward(s) Road on the face of the river terrace above the Kaniere River.<sup>4</sup> This vegetation is in good condition and all the height tiers are in tact.

Along part of the transmission line and the proposed Kaniere Race, to the north east of Lake Kaniere, there are large areas of manuka scrub, which was probably originally forest but has been cleared.

North and east of the proposed Kaniere Race is a secondary forest community that has also been logged but young rimu are regenerating, along with many other species.

There are two cleared areas on the lake on its eastern shore - at Hans Bay and Slip Bay. Dorothy Falls Road runs along the east side of the lake, and there is a small settlement at Hans Bay at the north end, and on Sunny Bight Road at the north west end, where there is a picnic area and beach.

Lake Kaniere is the main source of water for both Kaniere Forks and McKays Creek Power Schemes, though the water in the river is augmented by small local streams such as Butchers, Coal, Green and Blue Bottle Creeks.

---

<sup>4</sup> *Appendix 4. Vegetation communities on Kaniere Forks and Wards Road HEPS. Boffa Miskell.*

### 1.3. Scope of Landscape Rehabilitation Plan

The objectives of landscape rehabilitation work associated with the Kaniere Forks project are set out in Condition 20 (WDC General Conditions) 21 (WCRC General Conditions):

- “a) To re-establish an indigenous vegetation cover on all disturbed areas previously covered by indigenous species, excluding the HEPS footprint, unless otherwise specified by other conditions of these consents, including, but not limited to:*
- i. Kaniere Landing;*
  - ii. the canal and access road margins;*
  - iii. existing Kaniere Station penstock alignment upon the removal of penstocks; and*
  - iv. around the power station and tailrace*
- b) To minimise maintenance after completion of planting.*
- c) Having regard to the Scheme’s operational safety and efficiency, visually integrate finished structures, landforms and vegetation into the surrounding landscape.”*

The objectives of landscape rehabilitation work associated with the McKays project are set out in Condition 20 (WDC General Conditions) 21 (WCRC General Conditions):

- (a). “To re-establish an indigenous vegetation cover on all disturbed areas previously covered by indigenous species, excluding the HEPS footprint unless otherwise specified by other conditions of these consents, including but not limited to:*
- (i). the McKays Tunnel deviation envelope.*
- (b). To minimise maintenance after completion of planting.*
- (c). To the extent practicable, and having regard to the Scheme’s operational safety and efficiency, visually integrate finished structures, landforms and vegetation into the surrounding landscape.”*

The scope of the Landscape Rehabilitation Plan is set out in condition numbers 20, 21 and 22 in the General Conditions for the WCRC consents, and 19, 20 and 21 in the WDC General Conditions.

Based on these conditions the Plan will provide:

- A description of the things to be produced, maintained and undertaken during the construction period and for at least five years following construction
- Details as to the landscaping programme

- Methods for monitoring
- Methods for replanting (or regeneration) and rehabilitation
- Methods for animal and plant pest control

Condition number 21 and 22 respectively, sets out matters for which details must be provided:

- a) “All landforms, finishing, layouts, soiling, planting and re-grassing of roads and tracks;*
- b) Plans, layouts, sections, photographs, written explanations, schedules, quantities and timetables as necessary;*
- c) Methods for monitoring the success of rehabilitation plantings/regeneration on a six-monthly basis for the first two years and yearly thereafter for a minimum of five years following planting;*
- d) Rehabilitation procedures that will maximise the blending of the private haul roads, canal and any embankments and other proposed structures within the adjacent landscapes;*
- e) The management practices associated with stripping and stockpiling of vegetation and other rehabilitation resources;*
- f) The methods to be employed to manage and monitor pest plant species and pest animal species;*
- g) Locations, descriptions and plans of any areas where amenity/picnic areas are to be developed.”*

Management of construction effects on aquatic habitats will be addressed through separate conditions of consent – this LRP is confined to management of terrestrial vegetation and habitats.

This Draft LRP addresses these matters as far as possible given the stage of design at the time of preparing this Draft LRP. In particular, it is not practicable to provide further details or detailed plans for items (a), (b) and (g) at this stage. General outlines of works, methods and outcomes for those matters are however provided, and further details will be developed prior to the final LRP being submitted to the Consent Authority for endorsement following the detailed design process. The LRP is intended to be a ‘living document’ and will be updated to incorporate any necessary changes during the construction and monitoring periods in order to ensure that the relevant condition objectives and specific performance standards are achieved. All holders of the LRP will be sent updates when changes occur.

Figure (XX to be completed) shows the location of the areas to be rehabilitated, using the names identified in the proposed conditions.

## **2. OBJECTIVES AND PRINCIPLES**

### **2.1. Objectives of Landscape Rehabilitation**

Three objectives are set out in the conditions of consent:

1. To re-establish an indigenous vegetation cover on all disturbed areas previously covered by indigenous species, excluding the HEPS footprint, unless otherwise specified by other conditions of these consents, including, but not limited to:
  - i. Kaniere Landing and surrounding the intake;
  - ii. The Landing picnic area;
  - iii. The new canal, construction corridor and access road margins
  - iv. Existing Kaniere Station after removal of penstocks;
  - v. Around the new Ward Road power station and penstocks and tail race; and
  - vi. The McKays Tunnel deviation envelope.
2. To minimise maintenance after completion of planting and where possible encourage natural regeneration.
3. Having regard to the Scheme's operational safety and efficiency, visually integrate finished structures, landforms and vegetation into the surrounding landscape.”

### **2.2. Guiding Principles for Landscape Rehabilitation**

A number of general principles will apply to the way all construction works and rehabilitation are undertaken to assist in achieving the objectives. These principles will apply even if the details of design or construction are changed prior to construction, or have to be changed during the construction process due to unforeseen circumstances.

- 1 Works and rehabilitation will be programmed in such a way that areas of disturbed or bare soil are revegetated rapidly.
- 2 Natural regeneration of indigenous vegetation will be encouraged where it is an appropriate revegetation approach, and will be subject to active management (e.g. infill/enrichment planting, weed control and monitoring).
- 3 Revegetation/planting will use seeds and plant material sourced preferably from as close to the site of disturbance as possible. Seeds and plant material shall be sourced from within the Ecological District.

- 4 Seed sources for both indigenous vegetation and pasture will be certified as free from weeds that might become biodiversity or agricultural pests.
- 5 Soil or other materials brought into the site will be sourced from areas free from weed seeds, or cleaned to ensure that they do not contain weeds that might become biodiversity or agricultural pests.
- 6 Vehicles using the construction area on conservation land or passing through any substantial areas of indigenous vegetation (off public roads) will be cleaned prior to entering the areas of indigenous vegetation to minimise the introduction of weed seeds.
- 7 Sediment run-off, stormwater management, dust, noise and other potential effects on ecological or wider landscape values will be addressed through separate management plans, but these will take into account the contents of this LRP.
- 8 An appropriately qualified ecologist will be available during key stages of the construction works to advise on specific rehabilitation issues (e.g. on-site decisions about vegetation clearance, choice of additional fill sites)
- 9 Vegetation clearance will be carried out by an appropriately qualified or experienced contractor to avoid or minimise collateral damage to indigenous vegetation.
- 10 Cleared indigenous vegetation, wood debris, leaf litter and topsoil will be stored in an appropriate way, and re-used as close as possible to the site of disturbance.
- 11 Landowners, the Department of Conservation and the local community will be kept informed of progress of construction works and landscape rehabilitation.

### **2.3. Management and Monitoring Principles**

The LRP will guide rehabilitation associated with construction work throughout a period of at least five years. Monitoring is recommended by a number of Technical Reports and set out in Management Plans – this LRP sets out monitoring for the success of the rehabilitation programme and for plant and animal pests that may impact this success.

Monitoring will provide information that will be reviewed by TrustPower and fed into the overall management of the rehabilitation programme. Any changes needed to management plans will be reported to the Consent Authority and carried out in accordance with Condition 15 (WDC General Conditions) and 16 (WCRC General Conditions).

### **3. MATTERS CONSIDERED**

#### **3.1. Introduction**

In preparing the landscape rehabilitation programme and works, a range of matters has been taken into consideration. These are discussed in more detail in the relevant Technical Reports, but summarised here as background to the later sections of the LRP.

#### **3.2. Ecological Matters**

1. The types and values of existing vegetation and fauna habitats on the land affected by the construction works are the primary considerations in choice of plant species and development of vegetation outcomes. The overall aims of ecological rehabilitation are to minimise the loss of indigenous plant cover and to reduce edge effects and the fragmentation of vegetation cover. There is a focus on encouraging natural patterns of regeneration with enrichment planting to extend adjacent plant communities and restore fauna habitats as far as possible without compromising operational efficiency and safety of the HEPS.
2. One objective is to develop a low- or no-maintenance site after planting is completed. A self-sustaining site will require intensive site preparation, management and monitoring during the construction and planting programme. Provision for a small amount of on-going work as part of the HEPS maintenance is built into the LRP. This is likely to be weed monitoring and control, monitoring the success of rehabilitation and undertaking further rehabilitation if and where required. However, it must also be recognised that plant or animal pest numbers may be affected by factors outside the control of TrustPower during the lifetime of the LRP.
3. In this wet climate drainage will be an important factor in development of rehabilitation and vegetation outcomes and species selection. Drainage patterns will be determined when detailed project design and construction programmes are developed– this draft LRP will propose species groups from which individual species will be chosen according to local site conditions.
4. Cleared indigenous vegetation will be used as mulch or slash (a ground cover/seed source) on bared ground. When any indigenous vegetation clearance takes place, the material from different vegetation types will be stored in different areas but always as close as possible to the cleared area and potential re-use site. It is acknowledged that since the construction footprint is to be as small as possible, areas for additional stockpiles will be extremely limited. Margin areas along the total canal alignment will be used – given the small area of rehabilitation, only small stockpiles of mulch, soil etc will be needed. Clearance and re-use should be timed as close as possible to each other to minimise the growth of weeds on the stockpile and to maintain viability of the seed bank. Storage piles can become heated, destroying seeds and mycorrhiza.

5. The existing power line will be buried along the proposed KNF canal route which opens up the rehabilitation options there – previously, vegetation has had to be kept clear of the lines.
6. The canal/race operation also poses planting and species choice constraints. Species along the banks should not have deep roots that will compromise the integrity of the canal lining and there should be no plants in the flowing water to impede flows.
7. Taller/mature trees provide habitats for bats and birds as well as a long term seed source, and trees of high habitat value in KNF are identified in the Technical Report; it is desirable to avoid these trees through appropriate canal and track design where possible, and to leave them when clearing vegetation in the project area. These trees, together with any along the MKY route, will be marked during detailed design, selected on site by an appropriately qualified ecologist.

### **3.3. Landscape and Amenity Matters**

1. Maintenance of existing public access and the walkway alongside the old race will be provided as part of the construction works programme. Provision of an alternative walkway during the construction period has already been made. There will be consultation with DOC in relation to areas where the race will be decommissioned on conservation land.
2. As part of the upgrade picnic and resting areas will be developed in two locations along the route. The two areas to be developed during construction will be sited as below:
  - i. At 'The Landing' or intake to the Scheme. This area will be developed as a picnic area with tables and an interpretation area including information panels and a shelter feature for all weather viewing of the panels. The information panels here will be of high quality (stainless steel etching) and will incorporate information on heritage items and the proposed native fish pass system located there.
  - ii. The second amenity area is proposed at chainage 1000 - 1100m where a buffer storage area is proposed. The site would be developed to include picnic tables and will also include some heritage interpretation panels, again these would be of high quality stainless steel etchings. This would be completed within the proposed construction corridor.
3. Once the existing Kaniere Forks Power Station is decommissioned, the building and surrounding area will be used as another amenity area and a visitor / educational centre.
4. A programme of continuous maintenance will be provided for those areas of race that are decommissioned and will be developed in consultation with DOC and the Historic Places Trust

as provided for in Condition 22 and 23 (WDC General Conditions) and 23 and 24 (WCRC General Conditions)

### **3.4. Rehabilitation Works between the Intake/Landing Area and Chainage 500m**

The first 500 m of the new Kaniere Forks canal alignment (from Kaniere Landing) is the most visually prominent and “public” section of the proposed enhancement. For this reason, the areas available for rehabilitation planting along this section will be replanted (as opposed to either a mix of planting and natural regeneration, or natural regeneration) in vegetation type 1: primary rimu-miro forest (refer to Table A1 in Appendix 1 for more information on the species that are proposed for planting in this vegetation type). Where the canal batters are too steep to re-planted they will be left to regenerate naturally.

### **3.5. General Programming Matters**

1. The final landscape rehabilitation programme details will be developed once the construction programme is confirmed. Factors to be addressed then include timing of works so that the land surface is bare for minimal time; taking opportunities to share use of equipment for construction and landscape works; sharing access points; and ensuring that landform shaping work is done in anticipation of landscape works.
2. Planting work should generally be done in spring and autumn to achieve highest survival and growth rates; plants should be at least two years old at planting. This means that seed collection from the site should occur in advance of the commencement of construction work or locally sourced plants from an established nursery should be used. The advice of a suitably experienced ecologist, local nursery or DOC staff will provide guidance on optimum seed collection and planting timing in the area. Collection of seeds from indigenous species on conservation land will need a permit from DOC. The contracted propagating nursery may already hold one.
3. Land affected by the construction works is predominantly conservation land managed by the DOC, together with smaller areas of private land. The interests of both DOC and private landowners will be considered in developing the landscape rehabilitation programme.

4. During earthworks, transport of cut material for use as fill within the project area could lead to spread of biodiversity or agricultural weeds. Transport of material is likely to be minimised for engineering and economic reasons, which would also minimise ecological risk.

DRAFT

## 4. SITE PREPARATION

### 4.1. Introduction

In this Section of the LRP the site preparation activities are broadly described in relation to ecological and landscape aspects of rehabilitation.

For each type of task or activity, the key management practices that will be followed are outlined. Their detailed application will be developed as part of detailed design and construction programming.

### 4.2. Clearance

Vegetation and soil clearance will involve:

#### *General Management*

- An ecologist will be available for on-site advice prior to, and as required during, vegetation and soil clearance.
- Contractors will be briefed prior to vegetation clearance on the ecological values in and adjacent to the construction site.

#### *Felling Large Trees*

- Pre-construction check of trees for roosting bats (subject of separate consent condition)
- Felling of pre-marked trees will be done by an appropriately qualified or experienced contractor.
- As part of delineating the exact boundary of a construction envelope, trees to be saved will be marked in advance of clearance (probably during detailed design) or selected on site by an appropriately qualified ecologist.
- Careful planning of where trees will fall will be needed to avoid collateral damage on neighbouring vegetation that is not to be cleared
- Trees should be felled onto vegetation that is to be or has been cleared
- Felled trees will be cut up into small logs to speed up drying out. This will remove the habitat for pin-hole borer which would threaten remaining trees.
- Felled material will be left in the area of felling, stockpiled and used to provide mulch, nutrients and habitat for regeneration

#### *Indigenous Vegetation Clearance and Stockpiling (For Use as Mulch or Slash)*

- An ecologist working in consultation with the contractor will identify locations for stockpiles of different vegetation types throughout the construction envelope prior to the commencement of construction. The locations will balance the need to keep piles of different vegetation separate with the need to minimise transport distances. However, the limited space available for stockpiles is noted.
- Indigenous shrubs will be stripped from proposed construction areas and stockpiled at the identified locations.
- Stockpiling will aim to avoid heating in the stockpile. It may require the spread of stockpiled material (rather than compaction into a small area) or turning of the pile at intervals (e.g. fortnightly)
- Vegetation cleared from pasture or gorse scrubland will not be stored

### *Soil Stripping and Stockpiling*

- Sediment run-off control measures will be put in place prior to any soil stripping or stockpiling work
- An ecologist working in consultation with the contractor will identify locations for stockpiles of topsoil from areas covered by different vegetation types throughout the construction envelope prior to the commencement of construction. The locations will balance the need to keep soil piles from different vegetation types separate with the need to minimise transport distances. However, the limited space available for stockpiles is noted.
- Topsoil will be stripped from proposed construction areas and stockpiled at the identified locations
- Topsoil from areas with over 10% gorse or blackberry cover will be buried at fill sites
- Leaf litter, logs and organic debris form a valuable mulch and seed source material and will be collected and stored with vegetation where possible. They will be separated from the soil layer/stockpile.
- Where possible, the top 20 cm of soils should be stored separate from the lower layers – this is where the majority of the seed bank persists and requires careful treatment
- Stockpiling will aim to avoid heating in the stockpile, particularly in the soil from the top 20 cm. It may require the spread of stockpiled material (rather than compaction into a small area) or turning of the pile at intervals (e.g. fortnightly)
- Soil material should be re-spread as soon as possible.

#### 4.3. Earthworks and Drainage

- An ecologist will provide advice to the engineers and contractor on selection of fill sites to avoid or minimise adverse effects on indigenous vegetation.
- Disturbed sites will be topsoiled (with material from stockpile) and covered with vegetation slash or mulch (from the stockpile) and planted as soon as possible after completion of works.

DRAFT

## 5. REVEGETATION

### 5.1. Introduction

The key features of the revegetation programme are outlined here; more details of sites and species are given in Section 6.

Revegetation will be achieved through:

- Encouraging regeneration of indigenous vegetation from seed, by using slash and soil cleared in advance of work and stockpiled, in areas where construction disturbance has occurred
- Planting (and managing) indigenous “initial” and “enrichment” species into topsoil or into indigenous vegetation regenerating from slash and soil seed sources.
- Planting pasture areas with agricultural grasses (as selected by the relevant landowner). No introduced species or species that are not locally sourced will be planted on public conservation land.

Plant and animal pest control will be carried out (see Section 7).

### 5.2. Regeneration

Key features of regeneration work will be:

- Salvaged topsoil from the same vegetation type will be laid onto surfaces from which topsoil has been removed.
- Cleared scrub vegetation will be laid as slash onto new or newly bared topsoil to provide both a soils cover and a seed source – the slash will be sourced from as close to the receiving site as possible.
- Slash will be laid thinly over the whole disturbed area, in one layer with inter-branch gaps
- Manuka and kanuka slash will be used fresh wherever possible (i.e. having the minimum time in a stockpile).
- In developing the construction programme, consideration will be given to the value of using manuka and kanuka slash in January and February when it will contain fresh seed.
- Where the slope of the receiving site is gentle enough for use of slash cover, but greater than 1:3, the slash will be pinned in place using degradable stakes to prevent movement.
- Natural regeneration will be used as the preferred rehabilitation method since it requires minimal maintenance input. However, rehabilitation success and speed of recovery are dependent on the quality of the seed resource. This in turn depends on retaining undisturbed

soil where possible together with appropriate clearance, storage and re-use of topsoil and vegetation slash.

### 5.3. Indigenous Planting

Key features of planting work will be:

- Generic planting plans will be prepared (as part of the final LRP) for different areas which will be defined by the vegetation outcome, landforms, site uses and construction programme. These will confirm the range of resilient and easy-to-grow species that could be planted within each area and that is proposed in Table A1. Plant numbers, sizes and spacings will also be described using a template set out in Appendix 1, Table A1.
- Plants will be grown to an adequate size before planting to ensure high survival rates. The nursery growing plants for the project will be responsible for ensuring they are acclimatised to conditions at the final receiving site.
- Planting will be staged with early planting of quicker growing, early succession plants followed by “enrichment” planting of other species once some indigenous cover is established.
- Standard landscape contract conditions will apply in relation to maintenance and replacement of plant material, although these may be varied to reflect the objectives of the rehabilitation programme (e.g. reflecting actual construction period; using monitoring information).
- Plant selections for specific sites will be made on site as part of detailed design and construction when the micro-climatic, drainage and landform conditions are better understood.
- Fertiliser will not be applied in general to planted material; however its use may be considered in amenity areas.
- Weeding/release will be part of the nursery/landscape contract for planting; however, except at amenity areas, the focus of weeding will be on *ecological* weeds which may affect the ecological values of rehabilitated sites (i.e. not gorse).

### 5.4. Pasture

Areas of fill from the proposed Tunnel by-pass will be seeded with pasture according to the wishes of the landowners. When detailed design is completed, methods for reseeding and encouraging pasture development will be determined. TrustPower will not use seeds of plants that could become pests on conservation land on private land.

## 6. CONSTRUCTION AREAS AND VEGETATION TYPES

### 6.1. Introduction

This section outlines the vegetation types that will be used to rehabilitate each of the areas available for rehabilitation. The tables in Section 6.3 then provide more detail around the existing and proposed rehabilitation vegetation types for each of the areas construction envelopes.

### 6.2. Re-vegetation Types

A series of generic revegetation types has been identified at this stage and for each, a list of species from which to draw a planting list is proposed. As part of detailed design, the vegetation types may be refined and broken down to reflect environmental conditions or project requirements, and species added or removed from the lists. The vegetation types are:

**Table 6.1:** Number and short name of vegetation types proposed for rehabilitation<sup>5</sup>

Vegetation Type Number	Vegetation Type
<b>Kaniere Forks HEPS</b>	
1	Primary rimu-miro forest
2	Secondary rimu forest
3	Manuka scrub
4	<i>Carex</i> sedgeland
5	Mingimingi shrubland
6	Minigimingi shrubland / <i>Carex</i>
7	Silver pine forest
8	<i>Phormium</i> flaxland
9	Silver pine/manuka scrub
<b>McKays Creek HEPS</b>	
10	Secondary kamahi-quintinia forest
11	Pasture grassland

<sup>5</sup> The species proposed for planting within these areas are listed in Appendix1, Table A1

### 6.3. Kaniere Forks Enhancement

**Table 6.2:** Table providing a brief description of the proposed construction works and existing and proposed rehabilitation vegetation types for each of the areas to be rehabilitated along the Kaniere Forks construction envelope

	<b>Construction work<sup>6</sup></b>	<b>Existing vegetation</b>	<b>Proposed rehabilitation type</b>
A.	Weir and intake – upgrade within 10 m corridor; replace culvert under Kaniere Road; tunnel.	Downstream of Kaniere Road TR <sup>7</sup> /TL <sup>8</sup> : primary rimu-miro/kamahi- <i>Quintinia</i> forest	1, primary rimu-miro forest
B.	CH 000 to 480 – existing race into 15m corridor with 7m race and 3m gravel track (multi-user); cuts into hill slope (TR) preferred. 5m width for rehabilitation.	Adjacent TR/TL: primary rimu-miro/kamahi- <i>Quintinia</i> forest	1, primary rimu-miro forest
C.	CH 480 to 800 – new race in 25m corridor; power line undergrounded; access track. Old race/track crosses once. 12m width for rehabilitation.	Adjacent TR: manuka scrub Adjacent TL: primary rimu Existing: cleared, fernland/shrubland	1, primary rimu-miro forest 3, manuka scrub
D.	CH 800 to 1050 - new race in 25m corridor; power line undergrounded; access track. 12m width for rehabilitation.	Adjacent TR/TL: manuka scrub Existing: cleared, fernland/shrubland	3, manuka scrub
E.	Buffer storage area CH 1050– with access track; immediate surrounds for rehabilitation	Adjacent TR/TL: manuka scrub Existing: cleared, fernland/shrubland	3, manuka scrub
F.	CH 1050 to 1600 – new race in 25m corridor; power line undergrounded; access track. 12m width for rehabilitation.	Adjacent TR/TL: manuka scrub Existing: cleared, fernland/shrubland	3, manuka scrub
G.	Buffer storage area CH 1600 – with access track; immediate surrounds for rehabilitation	Adjacent TR: manuka scrub Adjacent TL: primary rimu-miro/kamahi- <i>Quintinia</i> forest Existing: cleared, fernland/shrubland	1, primary rimu-miro forest 3, manuka scrub
H.	CH 1600 – 1950 – new race in 25m corridor more or less on	Adjacent TR: secondary rimu/mountain	2, secondary rimu forest

<sup>6</sup> All chainages and dimensions are approximate at draft stage

<sup>7</sup> TR = true right side of the existing water race

<sup>8</sup> TL = true left side of the existing water race

	existing alignment; power line separate; access track; walking track. 15m width for rehabilitation	toatoa- <i>Quintinia</i> -rata forest Adjacent TL: primary rimu-miro/kamahi- <i>Quintinia</i> forest	
I.	CH 1950 – 2350 –new race in 25m corridor (in cut); power line underground; access track. Approx 3 m width for rehabilitation	Adjacent TR: secondary rimu/mountain toatoa- <i>Quintinia</i> -rata forest Adjacent TL: primary rimu-miro/kamahi- <i>Quintinia</i> forest Existing – cleared: fernland/shrubland	2, secondary rimu forest
J.	Ch 2350 to 2550 – slightly widen existing race; no power line; access track. Works rehabilitation only.	Adjacent TR: secondary rimu/mountain toatoa- <i>Quintinia</i> -rata forest Adjacent TL: primary rimu-miro/kamahi- <i>Quintinia</i> forest	2, secondary rimu forest
K.	Ch 2550 Option 1: new penstock to new KNF power station	Adjacent TR: weeping matipo scrub Adjacent TL: secondary rimu/kamahi forest	2, secondary rimu forest;
L.	Ch 2550 to 2800 Option 2: race in 15m corridor; new penstock to new KNF power station	Adjacent TR: primary and secondary rimu-miro/kamahi- <i>Quintinia</i> forest Adjacent TL: secondary rimu/kamahi forest and weeping matipo scrub (possibly affected)	1, primary rimu-miro forest 2, secondary rimu forest;
M.	Temporary works and laydown area	Wards Road wetland – diverse types	4-8, Wetland; 9 silver pine/manuka scrub
N.	New Wards Road Power Station	Wards Road wetland – diverse types	4-8, Wetland; 9 silver pine/manuka scrub
O.	New tail race to Kaniere River.	(Silver pine)/manuka scrub	6, Wetland; 9 silver pine/manuka scrub

#### 6.4. McKay's Enhancement

**Table 6.3:** Table providing a brief description of the proposed construction works and existing and proposed rehabilitation vegetation types for each of the areas to be rehabilitated along the McKays Creek construction envelope

	<b>Construction work<sup>2</sup></b>	<b>Existing Vegetation</b>	<b>Proposed rehabilitation type</b>
A.	Bypass option C – new race in 60m corridor with track. 15 m width for rehabilitation	Gorse scrub, secondary kamahi/ <i>Quintinia</i> forest; soft tree fern –rough tree fern tree-fermland	Mitigation for loss of secondary kamahi- <i>Quintinia</i> forest
B.	Bypass option D – new race in 60m corridor with track. 15 m width for rehabilitation	Gorse scrub, secondary kamahi/ <i>Quintinia</i> forest; soft tree fern –rough tree fern tree-fermland	Mitigation for loss of secondary kamahi- <i>Quintinia</i> forest
C.	New McKays penstock	Secondary kamahi forest – disturbed by installation of existing penstock	10, secondary kamahi- <i>Quintinia</i> forest
D.	New fill areas on farmland	Gorse scrub	11, Pasture

## **7. MONITORING AND MANAGEMENT**

### **7.1. Introduction**

In this section various aspects of monitoring, regeneration management and control of plant or animal pests are discussed.

In general, monitoring involves:

- measuring or counting indicators;
- reviewing results/ measurements to identify trends;
- assessing the connection between trends and construction or management activities; and
- reviewing construction and management activities to ensure that work continues towards the stated objectives

For this project, terrestrial ecological monitoring will cover:

- Indigenous vegetation establishment (the success of rehabilitation planting and regeneration); and
- Weeds (species, their abundance and distribution).

Plant and animal pests are present on the conservation and private land in the area of the existing and proposed HEPS. The first management step will be to prevent or minimise the incursion of weeds or animal pests into newly disturbed areas or adjacent conservation estate. Control of pests will be important in assisting the rehabilitation of disturbed land and regeneration of indigenous vegetation. It will also contribute to enhancement of the overall condition of indigenous vegetation and fauna communities in the area. Total eradication of pests from the HEPS site is not feasible, given the potential for re-invasion from adjacent land and is not a goal of the control programme.

The LRP identifies the key plant and animal pests and sets out methods that TrustPower proposes to undertake to control them. If required, a commercial pest control company may be contracted to deal with animal pests and they may propose additional or different methods based on initial monitoring of pest populations.

A commercial landscape contractor will be contracted to deal with plant pests, although an ecologist will be involved in initial monitoring and control. They too may suggest changes to the LRP based on their local knowledge and initial monitoring. Both contractors may propose changes to control methods over the period of planting and maintenance, depending on the outcome of initial controls.

### **7.2. Success of Rehabilitation**

#### *Introduction*

The measure of “successful rehabilitation” is set out in condition 19 (WDC General Conditions) and 20 (WCRC General Conditions):

- “(i) canopy cover of indigenous species or gorse is greater than 90%, with at least 50% canopy cover of indigenous species in terrestrial ecosystems;*
- (ii) canopy cover of indigenous species is greater than 75% in wetlands;*
- (iii) percentage cover of bare ground is less than 10%.”*

This recognises that gorse is an acceptable ground cover in early stages of indigenous forest succession as long as indigenous species form at least half of the canopy cover. Canopy cover will be measured by estimating species cover in each of a series of permanent vegetation plots throughout the rehabilitation area.

Rehabilitation success will use adaptive management to incorporate the results of six-monthly and annual monitoring into successive construction clearance, stockpiling and planting programmes.

#### *On-site Monitoring Method*

The permanent plots will be established by an ecologist immediately following completion of planting in a vegetation type or part of the project. The size and shape of each plot will be determined by the size and shape of the planted area, but will be in the order of 25 sq. m. A fixed photo point will be established. At the set-up visit the following will be recorded:

- Species present (and whether naturally occurring or planted)
- Estimated % cover of each species
- New plant sizes (in tiers or size classes)
- Visually assessed condition of dominant species
- % cover slash or mulch
- % bare ground
- Notes on pests, and weeds present, incursion and cover
- General site observations
- Photographs (including some fixed photo-points).

At follow up visits, the following additional information will be recorded:

- Dead “planted” plants – number and species
- Obvious plant deaths of naturally occurring species

Rehabilitation areas will be visited by an ecologist each six months after planting for a period of two years (that is, four visits per planted area). They will be visited annually for the following three years or until the cover target is achieved.

These visits are in addition to the normal landscape contractor maintenance visits through which the contractor will carry out work to meet planting contract conditions (typically 90% survival).

### *Analysing monitoring results*

Where planting occurs, “success” has two components: the successful establishment of individual plants; and the progress towards the objective of restoration of cover. Assessing these components will involve an ecologist and the nursery or landscape contractor.

Plant establishment will be monitored according to the landscape contract. Normally landscape contracts require a period of two years maintenance during which time dead plants are replaced (typically, to achieve 90% survival). The planting is likely to be carried out over an extended period, following the completion of construction works in different areas, and the planting/maintenance contract will reflect this. Following the two year contract replacement period, further replacement will become part of the normal TrustPower maintenance programme.

Reporting on plant replacement after each visit will be the landscape contractor’s responsibility for the two year contract period.

Trends towards restoration of cover at planted and regeneration and planting sites will also be reviewed on a 6-monthly, then annual basis by an ecologist using plots described above. Simple vegetation maps will be prepared to document progress.

Changes to species choice, planting methods, maintenance methods, construction methods or weed/pest control will be considered through follow up meetings between ecologist, landscape contractor and site engineer or construction manager. Unanticipated events (such as plant disease or pathogen attack) may affect success. Changes and reasons will be documented as annexes to the Landscape Rehabilitation Plan.

As set out in Condition 19 and 20 respectively, the annual monitoring of success will be carried out until cover reaches the prescribed target. This will almost certainly vary from site to site across the whole construction site, so that the amount of “success monitoring” will decline over time. It is likely that the canopy closure targets will be reached across the whole construction site at about 10 years after final planting work is completed.

### 7.3. Plant Pests

#### Introduction

The focus of weed monitoring and control will be on plant pests that could affect the success of rehabilitation or the ecological values in adjacent vegetation. Ragwort is an agricultural weed and will be managed by TrustPower on its own land as required by the West Coast Regional Plan and as a responsible landowner. For the purposes of the LRP, plant pests are considered as one of three types:

- 1) Ecological weeds that are currently found on or adjacent to the construction area through pre-construction monitoring;
- 2) Ecological weeds that could establish due to the construction works; and
- 3) Agricultural weeds such as gorse and ragwort where they occur on private farmland.

#### Species

The plant species that are already present and are considered threats to ecological values in the area are listed in Table 7.1.

**Table 7.1:** Plant species present in the existing environment adjacent to the Scheme that are or may become threats to ecological values

Species name	WCRC status	Existing status on site
Cotoneaster ( <i>Cotoneaster sp</i> )		Present
Himalya honeysuckle ( <i>Leycesteria formosa</i> )		Present
Montbretia ( <i>Crocsmia crocosmiiflora</i> )		Present
Ragwort ( <i>Senecio jacobea</i> )	“Pest” species	Present
Spanish heath ( <i>Erica lusitanica</i> )		Present
Hydrangea ( <i>Hydrangea macrophylla</i> )		Present only at McKays Creek Power Station

Examples of ecological weeds that could establish due to the construction works include species such as old man’s beard (*Clematis vitalba*) and wandering Jew (*Tradescantia fluminensis*); however, there is a wide range of ecological weeds that could be accidentally imported onto the site.

Gorse can in some circumstances be an ecological weed, but it can also assist rehabilitation through rapidly establishing a ground vegetation cover on bare ground, through which native species will eventually grow and dominate. Although gorse is considered a “pest” species in the West Coast Regional Plan has a role in the rehabilitation process at the Kaniere Forks/McKays Creek HEPS as an early successional species.

## *Prevention*

In accordance with best practice to avoid weed invasion and minimise spread, wheels/tracks and buckets etc of construction vehicles will be cleaned before entering conservation land and soil or gravels sourced from outside the site will be from weed free sites or subject to on-site quarantine or treatment.

## *Monitoring*

Weed monitoring and control will initially be carried out twice a year across all areas affected by construction, including into the edges of adjacent indigenous vegetation. Selective control in areas prior to construction may be carried out if this seems likely to reduce invasion and spread during and after construction – Spanish heath is a species that could be treated in this way. Such circumstances will be detected through the pre-construction weed monitoring programme.

Weed monitoring will take place in three types of area:

- 1 Where the construction corridor lies within indigenous vegetation; and
- 2 Forest outside of, but adjacent to the construction areas where a new edge has been created by the works.

## **Pasture**

Weed control on re-pastured areas on private land adjacent to the McKays Creek water race that have been disturbed by construction works will be the responsibility of the landowner.

## **Indigenous vegetation in, and adjacent to the construction corridor.**

Pre-construction monitoring will be based on a walk-through of the whole construction area by an ecologist and discussion with DOC. It is proposed that during the walk-through, the weed species cover and abundance will be estimated in each of the vegetation types (including undisturbed forest edge) and construction areas. This will provide a baseline to establish weed species and condition at the start of works for different environments and will assist in assessing the changes induced by the project.

The assessments will be repeated every six months until canopy closure targets are achieved. At some stage timing will be brought into line with the success and animal pest monitoring.

After canopy closure targets have been achieved, weed monitoring will become part of TrustPower's normal annual maintenance programme.

Following each site walk-through, the ecologist will report weed issues to TrustPower and weeds will be controlled by TrustPower staff or a contractor as appropriate.

## *Control*

Mechanical treatment (e.g. hand pulling) will be the preferred removal method, especially for small areas, but treatment with approved herbicide(s) will be carried out where necessary. The choice of herbicide and application method will be made by and ecologist in consultation with an approved contractor and be based on the level of threat at individual sites and the requirements of the West Coast Regional Council's Pest Management Strategy. This document requires landowners to control those species identified as "Pests" in the region. A number of documents and web-sites provide guidance on selection of control methods for these species.<sup>9</sup>

Weed treatment in the rehabilitation areas will aim to maintain the cover of existing species at levels recorded as a baseline through pre-construction monitoring. Any other invasive species that may be a threat to ecological values and which may be discovered during the programme will be treated appropriately.

Weed control will extend across all the construction area including the stockpiles of vegetation, leaf litter and topsoil.

### **7.4. Animal Pests**

#### *Species*

The animal pests that are considered threats to vegetation regeneration and successful establishment of planted material are:

- Hares
- Deer
- Possum

These animals are already present in the area, are extremely mobile, and are likely to affect plant growth in varying ways. Rather than attempt widespread and intensive control over the whole rehabilitation area, their control will be addressed through an adaptive management regime; that is, taking action only if planting success monitoring shows that animals are damaging plants. Grazing and browsing by these animals will be minimised by selecting plants that are less palatable species and considering the use of standard hare protectors around the trunks of selected new plants if monitoring shows that hares are damaging plants.

If early monitoring shows that hares or deer are causing a major failure of new plantings, the control programmes and plant selection will be reviewed.

## *Prevention*

---

<sup>9</sup> For example, Weedbusters web-site: <http://www.weedbusters.co.nz/>

Deer will be deterred from browsing in the HEPS area by human activity. This means that fewer are likely to be in the area when construction works are in progress. Regular presence of HEPS staff and walkers on the walkway will also contribute to disturbance. Hares and possum are less susceptible to human disturbance.

### *Monitoring*

Animal pest monitoring will be based on regular inspections of plant health and management responses. The work and responses would be done in consultation with the landscape contractor, since plant replacement will be part of the landscape contract, at least for the first two years post-planting.

Inspections of new plantings to detect pest damage will be made monthly for the first three months following planting; inspections will then be done at 3, 6, 12 and 18 months. With the exception of the first (3 month) inspection this will tie in with the 6-monthly monitoring of vegetation success. This 3 month inspection will be important for the early detection of any animal pest damage.

Following site visits, TrustPower will discuss options for animal control, amending planting methods or species, and replacement with the ecologist, landscape contractor and DOC.

## **7.5. Summary**

## 8. APPENDIX 1: SPECIES LISTS FOR EACH VEGETATION TYPE TO BE PLANTED

Table A1 encompasses the main plant species found currently in and near the proposed construction works in the different vegetation types. In developing the detailed design, species drawn from these lists will be used according to local site conditions, construction works details, final uses, and suitability for propagation. (See discussion in Section 1.3 in relation to timing of development of details).

**Table A1:** Species range and growth information for rehabilitation associated with Kaniere Forks and McKays HEPS

Rehab type number	Plant species proposed for re-vegetation in each of the proposed rehabilitation vegetation types	% in initial plantings	% in enrichment <sup>a</sup> plantings	Plant size	Plant spacing
1	<b>Areas B, C, L: Forest - primary/rimu</b>				
	<i>Dacrydium cupressinum</i>		X 50		
	<i>Prumnopitys ferruginea</i>		X 20		
	<i>Podocarpus cunninghamii</i>		X 30		
	<i>Weinmannia racemosa</i>	X 30			
	<i>Quintinia serrata</i>	X 30			
	<i>Pseudopanax crassifolius</i>	X <5			
	<i>Griselinia littoralis</i>	X <5			
	<i>Coprosma lucida</i>	X <5			
	<i>Myrsine divaricata</i>	X <5			
	<i>M. australis</i>	X <5			
	<i>Pseudowintera colorata</i>	X <5			
	2	<b>Areas H, I, J, K, L: Forest - secondary/rimu</b>			
<i>Dacrydium cupressinum</i>			X 20		
<i>Podocarpus cunninghamii</i>			X 20		
<i>Prumnopitys ferruginea</i>			X 20		
<i>Manoao colensoi</i>			X 20		
<i>Metrosideros umbellata</i>			X 20		
<i>Weinmannia racemosa</i>		X 20			
<i>Quintinia serrata</i>		X 20			
<i>Griselinia littoralis</i> (herbivore damage to be monitored)		X 10			
<i>Pseudopanax crassifolius</i>		X 20			

<b>3</b>	<b>Areas C, D, E, F, G: Manuka scrub</b>				
	<i>Manoao colensoi</i>			X 20	
	<i>Dacrydium cupressinum</i>			X 20	
	<i>Libocedrus bidwillii</i>			X 20	
	<i>Podocarpus cunninghamii</i>			X 20	
	<i>Phyllocladus alpinus</i>			X 20	
	<i>Leptospermum scoparium</i>	X 90			
	<i>Gahnia rigida</i>	X10			
<b>4</b>	<b>Areas M, N, O: Carex sedgeland</b>				
	<i>Coprosma propinqua</i>	X			
	<i>Cortaderia richardii</i>	X			
	<i>Carex spp*</i>	X			
	<i>Juncus spp*</i>	X			
<b>5</b>	<b>Areas M, N, O: Mingimingi shrubland</b>				
	<i>Coprosma propinqua</i>	X			
	<i>Coprosma tayloriae</i>	X			
	<i>Hebe salicifolia</i>	X			
	<i>Phormium tenax</i>	X			
	<i>Cortaderia richardii</i>	X			
<b>6</b>	<b>Areas M, N, O: Mingimingi shrubland /Carex</b>				
	<i>Manoao colensoi</i>			X	
	<i>Libocedrus bidwillii</i>			X	
	<i>Phyllocladus alpinus</i>	X			
	<i>Coprosma propinqua</i>	X			
	<i>C tayloriae</i>	X			
	<i>Myrsine divaricata</i>	X			
	<i>Leptospermum scoparium</i>			X	
	<i>Phormium tenax</i>	X			

	<i>Carex</i> spp ( <i>Carex secta</i> + others)	X			
<b>7</b>	<b>Areas M, N, O: Silver pine forest</b>				
	<i>Dacrydium cupressinum</i>		X		
	<i>Manoao colensoi</i>	X	X		
	<i>Libocedrus bidwillii</i>		X		
	<i>Griselinia littoralis</i>		X		
	<i>Weinmannia racemosa</i>	X			
	<i>Pittosporum tenuifolium</i>	X			
	<i>Coprosma areolata</i>	X			
	<i>Pseudowintera colorata</i>	X			
	<i>Carex virgata</i>	X			
<b>8</b>	<b>Areas M, N, O: Phormium flaxland</b>				
	<i>Phormium tenax</i>	100			
<b>9</b>	<b>Areas O: Silver pine/manuka scrub</b>				
	<i>Dacrycarpus dacrydioides</i>		X		
	<i>Manoao colensoi</i>		X		
	<i>Podocarpus cunninghamii</i>		X		
	<i>Libocedrus bidwillii</i>		X		
	<i>Myrsine divaricata</i>	X			
	<i>Weinmannia racemosa</i>	X			
	<i>Leptospermum scoparium</i>	X			
	<i>Coprosma propinqua</i>	X			
	<i>C. tayloriae</i>	X			
	<i>Juncus edgariae</i>	X			
	<i>C. virgata</i>	X			
	<i>Gahnia rigida</i>	X			
<b>10</b>	<b>Secondary kamahi-quintinia</b>				
	<i>Dacrydium cupressinum</i>		X		
	<i>Weinmannia racemosa</i>	X			

	<i>Quintinia serrata</i>	X			
	<i>Elaeocarpus dentatus</i>		X		
	<i>Ascarina lucida</i>	X			
	<i>Coprosma lucida</i>	X			
	<i>Pseudowintera colorata</i>	X			
<b>11</b>	<b>Pasture</b>				
	Pasture grasses	X			

\*species to be determined during summer site visits

<sup>a</sup> Enrichment plantings will be made at an appropriate time – when initial plantings are established and enrichment plants are ready for planting.

In wetland areas 4 - 9 the final rehabilitation vegetation types and species will be determined once detailed construction design is completed and final landforms and ground conditions are known.

DRAFT