

**BEFORE THE HEARINGS PANEL  
FOR THE PROPOSED QUEENSTOWN LAKES DISTRICT PLAN**

**IN THE MATTER** of the Resource  
Management Act 1991

**AND**

**IN THE MATTER** of Hearing Stream 14:  
Wakatipu Basin hearing and  
transferred Stage 1  
submissions related to  
Arrowtown and Lake Hayes

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**STATEMENT OF EVIDENCE OF GLENN ALISTER DAVIS  
ON BEHALF OF HOGANS GULLY FARM LIMITED**

**13 June 2018**

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## **1 Introduction**

- 1.1 I am Director and Principal Environmental Scientist of e3Scientific Ltd (formerly Davis Consulting Group Limited). I have been in this position since 2007. I have 20 years' postgraduate work experience in environmental management and hold a BSc in Ecology and MSc in Geography.
- 1.2 I have worked as a professional ecologist in the Queenstown Lakes District for the last 12 years. During this time, I have worked on a wide range of projects for the agricultural and land development sectors and for Queenstown Lakes District Council. I have provided ecological restoration services for a range of projects within the Queenstown area and have successfully implemented both small and large-scale restoration projects.
- 1.3 I oversaw the ecological assessment of the proposed Hogans Gully Golf development and found that the ecological impact of the footprint of the development will be minor however the ecological restoration proposed for the site would provide a significant contribution to the ecology of the Hogans Gully farm and the wider Wakatipu area.
- 1.4 Given the scale of the proposed plantings and potential ecological benefits associated with the restoration, Hogans Gully Farm Limited has asked me to present evidence on a how landscape scale ecological restoration can be undertaken to ensure the potential ecological benefits of the project are realised.

## **2 Key Elements of a Landscape-Scale Restoration Project**

- 2.1 The following sets out the key elements that need to be understood and implemented to ensure the success of a restoration project.
- 2.2 Restoration Project Objectives – Establishment of restoration objectives is the first key element that needs to be set out. In the case of Hogans Gully I understand the objectives to be:
  1. Enhance the remaining ecological values of the site through installation of plantings to increase indigenous plant species diversity and vegetation cover.

2. Establishment of new restoration plantings adjacent to the remaining areas to increase indigenous cover, plant species diversity and provide habitat for invertebrates, lizards and birds.
  3. Use of the plantings for the purpose of landscaping the site and visually integrating the proposed buildings throughout the site from wider views
- 2.3 Understanding the Environment - Understanding the physical geography and challenges of the site is critical to developing a restoration plan. This includes developing a detailed plan of the soil types, geology, topography and microclimatic variations across the site. Once these variables are understood vegetation communities can be assigned to the landscape. Within the Hogans Gully site there will be two core vegetation communities including wetland/riparian communities in the bottom of gullies with dryland communities on the hillslopes and crests.
- 2.4 Species Selection – Species selection is critical. Most of the species used in the restoration should be species that have been proven to perform in similar environments. Fortunately, there is a growing number of successful restoration projects in the vicinity of the site that can guide the planting mix including restoration plantings around Lake Hayes, White Chapel and along Malaghans Road.
- 2.5 Ecological Management Plan – Once the objectives of the restoration plantings are clear and the existing environment is well understood an Ecological Management Plan to guide the restoration work can be prepared. This document should be used to guide all aspects of the restoration work including the presentation of plans showing the planting areas and vegetation communities, fencing and irrigation plans, documenting the plant species and numbers, detailing planting procedures and maintenance requirements, setting out performance objectives and measurement criteria and audit and reporting requirements. I provide examples of two Ecological Management Plans that I have prepared and utilised in the implementation of two landscape scale restoration projects in the Wakatipu area. I provide a summary of the implementation of these projects in section 3 of my evidence.
- 2.6 During the drafting of the Ecological Management Plan the method for managing rabbit and hare browse (and other pests such as goats) needs to

be addressed. All plants need to be installed with plant shelters at a minimum however rabbit control and/or rabbit proof fencing may also be necessary.

- 2.7 Once the ecological management plan has been finalised and accepted by the proponent and council, procurement of plants and selection of a planting and maintenance contractor can be undertaken. Procurement of the plants and ensuring the plants are in good health prior to installation is critical. To this end, there should be a very short time period between the plants being delivered from the nursery and subsequent installation. Plants should be held onsite for not longer than a few days before being planting. Ensuring the planting contractor can keep up with plant delivery is therefore very important and needs to be managed closely.

### **3 Restoration Examples and Planting Requirements**

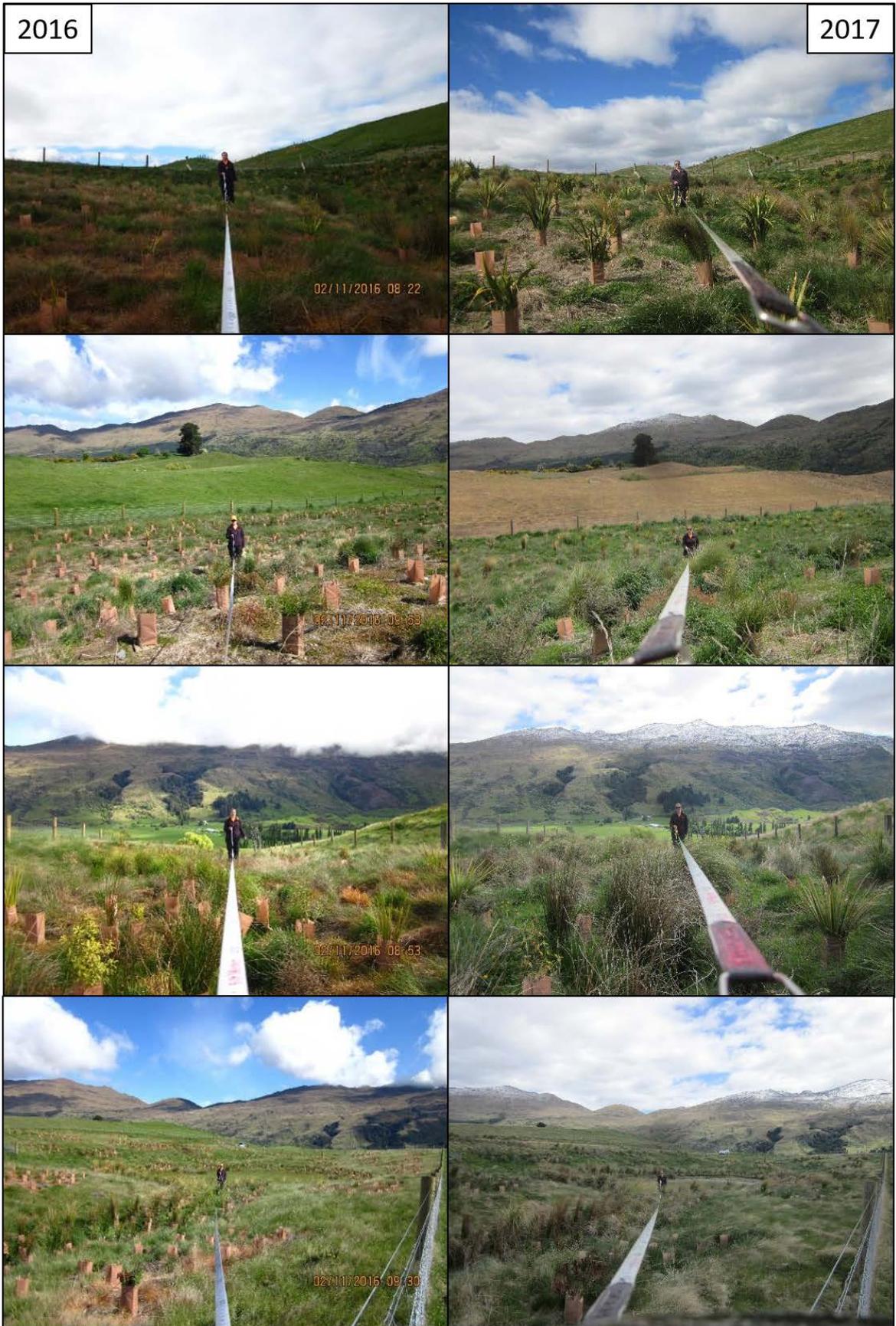
- 3.1 Examples of landscape-scale restoration projects that I have managed that have followed the above process include the Walter Peak Subdivision restoration that I have worked on since 2012 and the Highground restoration project that I have managed since 2014. I provide the management plans for each of these projects as Attachments A and B.
- 3.2 Highground – In 2014 I prepared an Ecological Management Plan to support an ecological restoration project on the Highground subdivision on Malaghans Road. The ecological restoration was a consent condition of the subdivision consent. The restoration project included the planting of 23,000 plants into five different environments over 14 areas across the subdivision. These areas included both northerly and southerly aspects, wetlands and plantings surrounding ponds. All of the planting areas were rabbit proof fenced prior to planting and all of the dryland plantings were installed with protective shelters, irrigation and fertiliser. The 2017 monitoring results showed that there is currently a 73 % survival rate of the plants.
- 3.3 Walter Peak Subdivision – In 2013 I prepared a Landscape Management Plan to support an ecological restoration project at Walter Peak. The project involved the installation of 8155 plants in Spring 2013 and Spring 2014. Plants were planted with protective shelters and fertiliser. The monitoring for these

plants has concluded with those planted in 2013 having an 84 % success rate and those planted in 2014 having a 77 % success rate after three years.

- 3.4 Twice yearly maintenance of the planting areas has occurred, which include woody weed control, hand weeding within the plant shelters and spraying around the plants to minimise rank grass growth. The maintenance programs at both Walter Peak and Highground has been crucial for plant survival. A similar strict maintenance program will be required for the Hogan's Gully plantings.
- 3.5 The success of the plantings can be attributed to the program of works that has been developed and followed by e3Scientific. These include eco-sourcing plants, hardening plants off in the nursery, plant grade (V150 to 1 Litre), plant spacings (no greater than 1.2 m centres), a well-formed hole, fertiliser, irrigation and mulch (where possible), plant shelter and twice-yearly maintenance.
- 3.6 Examples of growth rates that could be expected of planting areas are shown in the following plates. Plate 1 shows the 2014 and 2017 monitoring results from photo monitoring points from Walter Peak. Plate 2 shows the results from the photo monitoring points from Highground from 2016 and 2017.
- 3.7 The results from the photo monitoring points show that the establishment of vegetation within the Wakatipu Basin can be achieved in a relatively short timeframe.



3.8 Plate 1. Walter Peak Photo monitoring points from 2014 and 2017



3.9 Plate 2. Highground Photo monitoring points from 2016 and 2017

#### **4 Concluding Statement**

- 4.1 Landscape-scale restoration ecological planting is being undertaken in the Wakatipu and a process for the success of these projects is now well established.
- 4.2 The ecological restoration proposed by Hogans Gully Farms Limited can provide significant ecological benefits to the site and the wider Wakatipu basin when assessed in the context of the wide range of restoration and conservation programmes being undertaken within the Wakatipu Basin.

**Glenn Davis**

**13 June 2018**

Attachment A – Landscape Management Plan Walter Peak Station Trust

Attachment B - Landscape Management Plan 438 Malaghans Road,  
Queenstown

Attachment A - Landscape Management Plan Walter Peak Station Trust

# Landscape Management Plan Walter Peak Station Trust



*September 2013*



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## Landscape Management Plan – Walter Peak Station Trust Subdivision

### Document Status

<b>Version</b>	<b>Purpose of Document</b>	<b>Prepared By</b>	<b>Reviewer</b>	<b>Review Date</b>
A	Draft for review	GD	NS	14 May 2012
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## TABLE OF CONTENTS

	<b>Page No.</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
<b>1.1 Overview</b>	<b>1</b>
<b>1.2 Scope of the Ecological Documentation</b>	<b>1</b>
<b>2.0 PLANTING PROGRAMME AND MAINTENANCE OF EXISTING PLANTINGS</b>	<b>2</b>
<b>2.1 Planting Requirements</b>	<b>2</b>
2.1.1 Stage 1	2
2.1.2 Stage 2a	3
2.1.3 Stage 2b	3
2.1.4 Stage 2c	3
<b>2.2 Maintenance of Existing Plantings</b>	<b>4</b>
2.2.1 Stage 1	4
2.2.2 Stage 2a	4
2.2.3 Stages 2b and 2c	4
<b>3.0 PROJECT PERFORMANCE OBJECTIVES AND MEASUREMENT CRITERIA</b>	<b>5</b>
<b>3.1 Objectives</b>	<b>5</b>
<b>3.2 Measurement Criteria</b>	<b>5</b>
3.2.1 New Plantings	5
3.2.2 Objective Assessment of Landscape and Restoration Planting Performance	8
<b>4.0 IMPLEMENTATION STRATEGY</b>	<b>10</b>
<b>4.1 Measures to Ensure Project Performance Criteria are Met</b>	<b>10</b>
4.1.1 Project planning & management	10
4.1.2 Planting procedures	10
4.1.3 Planting maintenance	11
4.1.4 Pest Protection	12
4.1.5 Stock Grazing	12
4.1.6 Irrigation Maintenance	12
<b>4.2 Audit and Review of Performance</b>	<b>13</b>
4.2.1 Annual Audit	13
4.2.2 Audit at Year Three	13

## LIST OF FIGURES (compiled at rear)

### Figure No.

- 1 Stage 1 Planting and Maintenance Plan
- 2 Stage 2a Planting and Maintenance Plan
- 3 Stage 2b Planting and Maintenance Plan
- 4 Stage 2c Planting and Maintenance Plan
- 5 Planting and Performance Assessment Timeline
- 6 Stage 1 Photo Monitoring Location Plan
- 7 Stage 2a Photo Monitoring Location Plan
- 8 Stage 2b Photo Monitoring Location Plan
- 9 Stage 2c Photo Monitoring Location Plan
- 10 Irrigation Plan
- 11 Indicative Stock Grazing Plan

## **1.0 INTRODUCTION**

### **1.1 Overview**

On behalf of Walter Peak Station, Davis Consulting Group Limited (DCG) and Land Limited (LAND) have prepared the following landscape management plan (LMP) to support landscape and ecological restoration work that is set out in the following report:

- Davis Consulting Group Contract Report (July 2013) Review of Walter Peak Developments Landscape Works and Consideration of Alternative Approaches.

The LMP has been prepared to guide the implementation of the Walter Peak subdivision landscape and restoration activities in order to ensure the expectations of landuse consent conditions are achieved. The LMP is a living document that should be updated annually to reflect the performance of the landscape and restoration work and meet any additional challenges that are currently not foreseeable.

### **1.2 Scope of the Ecological Documentation**

The LMP documentation is set out as follows:

- Section 2: Details the planting and maintenance programme for existing plantings;
- Section 3: Documents project performance objectives and measurement criteria; and
- Section 4: Presents an implementation strategy designed to ensure that appropriate management measures are implemented to achieve the planting performance goals.

## 2.0 PLANTING PROGRAMME AND MAINTENANCE OF EXISTING PLANTINGS

The following section documents the planting requirements as set out in the consent variation being applied for. A series of plans (see Figures 1, 2, 3 and 4) have been prepared, which show the locations of the plantings within the four landscape planting stages (i.e. Stages 1, 2a, 2b and 2c). Plantings associated with each stage are detailed below.

### 2.1 Planting Requirements

#### 2.1.1 Stage 1

The planting requirements for Stage 1 are set out in Figure 1 and summarised below:

- A total of 16 groups of 10 beech trees are to be planted into Areas B8, B9 and B11 to assist with the development of a forest representative of the original vegetation. Within the groups plants should be at 1.5 metre centres and shall be a v150 grade. The red beech plantings need to be located on sites that are sheltered with deeper soils.
- Twenty groups of 20 plants in Area V1 are required to assist with development of vegetation behind the lodge and adjacent to the site entrance road. The plantings will consist of a mix of mountain beech, *Pittosporum tenuifolium*, broadleaf, wineberry and *Coprosma lucida*. These shall be planted at 1.5 metre centres and can be v150 grade.
- A total of 14 groups of 10 plants in Area M1 located to the east of Mick O'Day Creek and north of the proposed lodge. The plant mix shall consist of red beech, mountain beech, kowhai and pittosporum.
- Planting of 400 plants into the riparian margin of Mick O'Day Creek (R1 area in Figure 3). The plantings should be dominated by *Carex secta* but also include flax and toetoe and shall be a v150 grade. Such appropriately selected plant species can withstand flooding events unless the whole substrate is removed in a major flood.
- Planting of ten groups of woodland species and kahikatea into the wetland area (W2 area in Figure 3), which will further improve existing values. A total of ten plants per group should be planted and include the following species kahikatea, *Olearia lineata*, *Olearia bullata*, *Coprosma propinqua* and *Coprosma rugosa*. The plant size used for planting in the wetland area shall be v150 grade.
- Control of grey willow, broom and himalayan honeysuckle needs to occur in the wetland area (W2 area in Figure 3). Removal of broom and other woody weeds also needs to occur in areas B8 to B11 and M1. We note that no herbicide spraying should be undertaken so as to avoid killing the regenerating silver tussock. Grey willow also needs to be removed in the M1 planting area.

### 2.1.2 Stage 2a

The planting requirements for Stage 2a are set out in Figure 2 and summarised below:

- Planting of a total of 30 groups of beech trees into areas defined for forest planting (B1 to B7 in Figure 4). A total of 25 beech trees should be planted per group and at 1.5 metre centres at a PB3 grade. The re-planting of beech, with careful maintenance, will provide the basis for forest development representative of the original vegetation cover.
- Planting a total of 77 groups of grey shrubland species into the G1, G2, G3 and G4 areas. A total of 25 shrubs will be planted per group.
- In the tussock planting areas we do not believe that any further planting is required to meet the consent conditions.
- Planting a total of 10 groups of wetland plant species in the W1 area (see Figure 4), to assist wetland and riparian development. A total of 25 plants per group are proposed for planting and include *Carex secta*, toetoe, kowhai, flax and *Olearia* species. We note that re-planting close to future construction activity (i.e. the house sites) should not occur until after the houses are built to prevent unnecessary loss of plantings.
- Planting a total of 6 groups of kowhai, with 5 plants per group, into the K1 and K2 areas (see Figure 4) along the lakeshore.

### 2.1.3 Stage 2b

Figure 3 provides a plan showing indicative areas where we propose to plant stands of beech. The proposed planting associated with Stage 2b will include the planting of approximately 2500 trees which will consist of 80% mountain beech and the remaining 20% consisting of a mix of broadleaf, lemonwood, putaputaweta, *Coprosma lucida* and wineberry. The trees will provide a seed supply to assist natural regeneration of the gullies over time (in excess of 20 years). Most of the plants (2000) shall be a v150 grade however 500 larger grade plants (such as PB5) should be utilised for planting into the favourable sites within the broom. This approach is designed to support natural regeneration through the broom and also assist with the inoculation of the soil with mycorrhizae to further promote strong recruitment and growth of beech trees in the gullies. In order to assist beech forest development beech tree seeding will be undertaken at year 5 in an attempt to increase the rate of forest development. Subsequent seeding events will be undertaken based on the outcomes of the first seeding event.

### 2.1.4 Stage 2c

Figure 4 provides a plan showing the area to be planted. Approximately 1500 plants will be planted into the gully bottom with a selection of species such as mingimingi, toetoe, tree daisy and flax. Beech, broadleaf, shining leaved coprosma, wineberry and pseudopanax species will be planted on the margins of the gully bottom. All plants shall be a V150 grade.

## **2.2 Maintenance of Existing Plantings**

### **2.2.1 Stage 1**

The lakeshore and marina plantings are well established. The maintenance effort associated with Stage 1 is woody weed control, particularly grey willow in the wetland and broom developing within the lakeshore and marina plantings.

Some mowing of tracks will be undertaken but grass control is not proposed where plants have established. This approach has been adopted as established plants will not be affected by weed growth and will out-compete introduced grasses over time. Furthermore, while present, the weeds will provide shelter and reduce rabbit/hare browsing as they prefer short grass swards to move through as opposed to longer grass. The presence of introduced grass will result in reduced pest control requirements.

### **2.2.2 Stage 2a**

While there has been significant loss of plants in Stage 2a the plants that have established are now 2 – 3 years old and will require only minor maintenance efforts from now on. Weed control around the established plants is not proposed as the weeds should no longer effect plant development as explained above.

### **2.2.3 Stages 2b and 2c**

To date there has been no planting undertaken in Stages 2b and 2c. Maintenance measures will be those associated with the plantings in Section 2.1.3 and 2.1.4 and as detailed in the Implementation strategy in Section 4.

### 3.0 PROJECT PERFORMANCE OBJECTIVES AND MEASUREMENT CRITERIA

#### 3.1 Objectives

The overall objectives of the restoration and landscape works are to provide ecological compensation consistent with the expectations of the consent order and to mitigate the landscape effects for consented building sites. Specific ecological objectives considered in the consent order include:

1. Significantly increase the diversity of native species on the site and reduce weed dominance;
2. Re-establish onto the site most of the plant species that would have dominated the pre-human vegetation;
3. Establish plantings that have the ability to self-sustain themselves by seeding both within the development and providing a seed source for the wider area;
4. Establishment of riparian vegetation adjacent to the lower reaches of Mick O'Day Creek to enhance the instream habitat of the creek;
5. Provide habitat for a diverse range of native invertebrates, skinks, geckos and birds;
6. Establishment of communities that over time (approx. 20 years) become relatively stable systems requiring minimal maintenance;
7. Establishment of forests that over time develop into more complex systems resembling their original condition with increased biological diversity.

#### 3.2 Measurement Criteria

This section provides measurable criteria designed to track planting performance over time. Failure to achieve the measurement criteria shall trigger a review of the planting programme (see Section 2) and implementation strategy (Section 4) to determine if additional measures are required.

##### 3.2.1 New Plantings

For all new plantings in all landscape stages the following criteria shall be achieved:

- Within two years of gaining consent to vary the landscape plan, all plantings (as described in section 2.1 and shown on the planting plans) shall be completed;
- A total of 70% of new plant survival shall be achieved three years after installation. Infill planting will be undertaken to achieve 70% survival of the original plantings in the event this measurement criteria is not achieved;
- Within 5 years of planting, the assemblage of native plant species established on the site will be representative of the sites pre-human vegetation cover;

- Indigenous vegetation cover of 80% of the new planting areas shall be achieved within 10 years of planting; and
- A total of four vegetation communities (lakeshore, beech forest, grey shrubland and wetland/riparian) shall be established and self-sustaining on the site within 10 years of planting, including the capacity to support associated native invertebrates, lizards and birds.

In addition to the above generic criteria a number of stage specific performance measurements are set out below.

#### *Stage 1*

- All forest plantings will have established (requiring only minor maintenance work) within 5 years of planting;
- The Mick O'Day riparian plantings will have established (requiring only minor maintenance work) within 5 years; and
- Woody vegetation in the wetland area will have established (requiring only minor maintenance work) within 5 years.

#### *Stage 2a*

- All beech tree plantings shall have established (requiring only minor maintenance work) within 5 years of planting;
- Beech trees to obtain a height of 4 metres within 10 years of planting (see example of 10 year old beech trees at Walter Peak in Plate 1);
- Beech litter shall be accumulating within the beech stands within 10 years of planting as is occurring in the beech stand at Walter Peak; and
- All grey shrubland, wetland and kowhai plantings shall have established (requiring only minor maintenance work) within 5 years of planting.

#### *Stage 2b*

- All beech tree plantings shall have established (requiring only minor maintenance work) within 5 years of planting;
- Beech trees planted into the broom in Stage 2b shall be starting to overtop the broom within 5 years of planting (see Plate 2); and
- At least one beech seeding event shall have been undertaken into the gullies within 5 years of planting.

*Stage 2c*

- Within 5 years of planting, the plantings in the gully bottom will have established (requiring only minor maintenance work); and
- Within 5 years of implementation, native seedlings will be establishing within the stands of bracken fern.



**Plate 1:** A photograph of a stand of beech trees approximately 10 years old near Mick O'Day Creek on the WPS site.



**Plate 2:** A representative photograph of what the beech trees planted into broom in Stage 2b might look like once they start to overtop the broom within 5 years of planting.

### 3.2.2 Objective Assessment of Landscape and Restoration Planting Performance

In order to objectively determine measurement criteria have been met, an inventory of the percentage indigenous vegetation cover will be recorded over time for the entire landscape area. An estimation of percentage vegetation cover within each plant community will be recorded from the same location point each year. Permanent photo points shall be established to support the assessment.

In addition, aerial photography will be completed at the end of planting in October 2014 with follow up photography completed following three years of growth in October 2017. Interpretation of this photography, in addition to fixed photo points and a qualitative assessment of canopy cover will provide an accurate assessment of the development of both the existing and new plantings.

The timeframe for planting, plant maintenance and performance assessment is provided in Figure 5.

**Figure 5: Planting and Performance Assessment Timeline**

		Years									
		1	2	3	4	5	6	7	8	9	10
<b>Planting</b>	Stage 1, 2a, 2b & 2c	█									
	Stage 2b	█				█					
<b>Maintenance</b>	Stage 1, 2a, 2b & 2c	█									
<b>Performance Assessment</b>	Stage 1, 2a, 2b & 2c	█									
<b>Auditing</b>	Stage 1, 2a, 2b & 2c	█					█				

Key:

█	Planting of Stages 1, 2a, 2b & 2c
█	Seeding of Stage 2b with mountain beech seed
█	Maintenance of existing and re-planted areas
█	Estimate of overall percentage vegetation cover for each plant community within each Stage
█	Annual auditing
█	Biennial auditing (dependant on approval from Queenstown Lakes District Council)

## 4.0 IMPLEMENTATION STRATEGY

### 4.1 Measures to Ensure Project Performance Criteria are Met

The overall objective of the project is the establishment of ecological restoration zones, such as forest, grey shrubland and wetland, which over time (15 – 20 years) will develop into more complex, relatively stable systems resembling their original condition with increased plant diversity and requiring minimal maintenance. The implementation strategy to achieve this objective is set out in detail below.

#### 4.1.1 Project planning & management

The planning and management for the landscape works are outlined below:

- The project management team (PMT) that will oversee the project will include an ecologist and landscape architect;
- The PMT will select a landscape contractor to undertake all plantings and maintenance;
- The PMT will manage the supply of plants for the planting programme and ensure plants arrive onto the property at a time when the landscape contractor is ready to plant. This will minimise the time plants will be onsite before planting occurs.
- Implementation of the landscape management plan is set out in Figure 5 (i.e. planting, maintenance, performance assessment and auditing), with allowance for changes to occur based on project progress;
- All planting will occur with plants of appropriate size (V150 or PB3 as detailed in Section 2.1), being eco-sourced where possible and planted in groups;
- The species to be planted have been chosen based on the success of previous plantings and expert planting experience of the PMT;
- The final species choice and planting locations are detailed in Figures 1 - 4;
- The landscape contractor will carry out all planting and maintenance to the standard expected by the PMT (as outlined in the planting procedures and maintenance below);
- The plantings and maintenance will be monitored for 10 years from the date of first planting, as set out in Section 3.2, Section 4.2 and Figure 5.

#### 4.1.2 Planting procedures

The planting procedures to be followed are outlined below:

- Before any planting occurs, an irrigation dripper system will be set up to irrigate all new plants planted into the Stage 2a area.

- A shaded, irrigated nursery must be maintained on site, where plants can be accounted for prior to installation.
- Plants of the correct species and size will be sourced by the PMT.
- The plants must be appropriately transported to the site so that no unnecessary damage, dehydration or deterioration of the specimens occurs. The PMT will manage this process with the nursery.
- Once onsite the plants shall be left in the on-site nursery for no longer than two weeks before planting occurs.
- If long grass is present at the planting sites spot spraying with Gallant shall be undertaken, then planting will occur through the dying/dead grass.
- Plants must be transferred directly from bags/pots into their plant hole. *Please note - plants shall not be removed from bags/pots and laid out while awaiting planting.*
- All plants must be thoroughly watered prior to planting.
- Planting shall only occur in the late winter/early spring.
- All plantings must be pocket planted as per the group numbers, distances and location on Figures 3 and 4.
- Plant shelters and weed mats shall be installed around all plants to reduce the risk of pest browse, assist with weed control and provide wind shelter.

The dripper irrigation system referred to above will be installed by Waterforce, experienced irrigation professionals. Figure 10 provides an irrigation plan which has been prepared to allow for irrigation to the Stage 2a planting area.

#### 4.1.3 Planting maintenance

WPS has engaged an experienced landscape maintenance contractor for the project. A contract is in place that provides for 4 contractors to undertake 6 weeks of maintenance per year for a period of 3 years. Most of the maintenance effort will occur over the spring/early summer period when vegetative growth is most vigorous. In the event additional work is identified during routine monitoring of the project the landscape maintenance contractor will be engaged to complete additional work if deemed necessary by the PMT.

Specific plant maintenance measures required to assist the establishment of development of plantings are listed below:

- In the Stage 1 wetland area grey willow, broom, himalayan honeysuckle and other woody weeds must be controlled.
- Control of broom and other woody weeds is required in all areas, except where it is acting as a nursery for native plantings in Stage 2b and 2c.

- Re-planting will occur where any of the new plants have failed but with consideration of why failure occurred and any adjustments made before replacement.
- Any additional maintenance that is identified through the bi-annual/annual auditing and performance (detailed in Section 4.2) and the quantification of planting performance (detailed in Section 3).

In addition to the above we note that over time (>20 years) it is possible that beech trees will start to seed and establish outside the areas planted in beech. For the purposes of maintaining views from the lodge in Stage 1 and the house sites in Stage 2a this management plan specifically allows for the removal of any beech that establish in community M in Stage 1 and below an altitude of 340m in communities G, K and W in Stage 2a. Figures 1 and 2 clearly show the distribution of these communities.

#### 4.1.4 Pest Protection

The rabbit population on Walter Peak Station is considered very low and according to the Walter Peak Station manager, hares are more likely to browse the new plantings. In order to mitigate this issue all new plants will be planted with protective shelters. Furthermore, the management measure of spraying the grass around the plantings that was undertaken by the previous landscape contractors will not be continued. This will result in rank grass growing between the plants and also allow for the ongoing regeneration of bracken fern. Rabbits and Hares prefer to move through short grass swards which should further reduce rabbit and hare browsing on the new plantings.

Once the plants are established, assumed to be at year three, ongoing protection of the plants from rabbits and hares should not be necessary. We understand from the site manager that possums may be more of a concern, however at this stage possums do not appear to be a significant issue in the development of the plantings. Notwithstanding this point, the plantings will be monitored and should possum browsing be identified, a management response will be implemented.

#### 4.1.5 Stock Grazing

Two areas of the subdivision site will continue to be managed by Walter Peak Station for stock grazing purposes. Figure 11 shows the location of the grazing areas. Walter Peak Station will ensure stock proof fencing is maintained to ensure the stock are prevented from entering the landscape areas.

#### 4.1.6 Irrigation Maintenance

Maintenance of the irrigation system will be required to ensure all new plants are being watered effectively. The landscape contractor will be responsible for maintaining the irrigation system

and will be onsite at least 6 times during the Spring/Summer period when irrigation will be most critical. In addition, the Walter Peak Station manager can check the irrigation system during dry periods to ensure the irrigation system is operating effectively and can advise the PMT if maintenance efforts are necessary.

## **4.2 Audit and Review of Performance**

### **4.2.1 Annual Audit**

At the completion of the planting programme (i.e. the end of year 2) an audit of planting performance will be completed on an annual basis for the first three years. This audit is in addition to the quantification of planting performance outlined in Section 3.2.2. Providing the plantings are establishing in accordance with the performance criteria at the end of year 5 in Section 3.2.1, it may be possible to reduce the number of site audits to biennial after three years. Such a change will be determined in consultation with QLDC.

At a minimum, all audits shall record the following:

- The number of plants that have failed during the year ;
- The number of each species that have failed during the year ;
- Provide recommendations for any additional maintenance works required.

In addition to recording the above information, the photographs of plantings shall be taken annually from defined locations to record plant development. Figures 6 – 9 provide plans showing the location of photo monitoring points in each planting stage. The photos shall be taken in the direction shown on the plans.

Within one month of each audit a brief factual report shall be submitted to QLDC, which will include a summary of the four points listed above, as well as a summary of the quantification of planting performance outlined in Section 3.0. If performance criteria are not achieved the audit report shall review why this has occurred and what the mitigation efforts will be to improve performance.

### **4.2.2 Audit at Year Three**

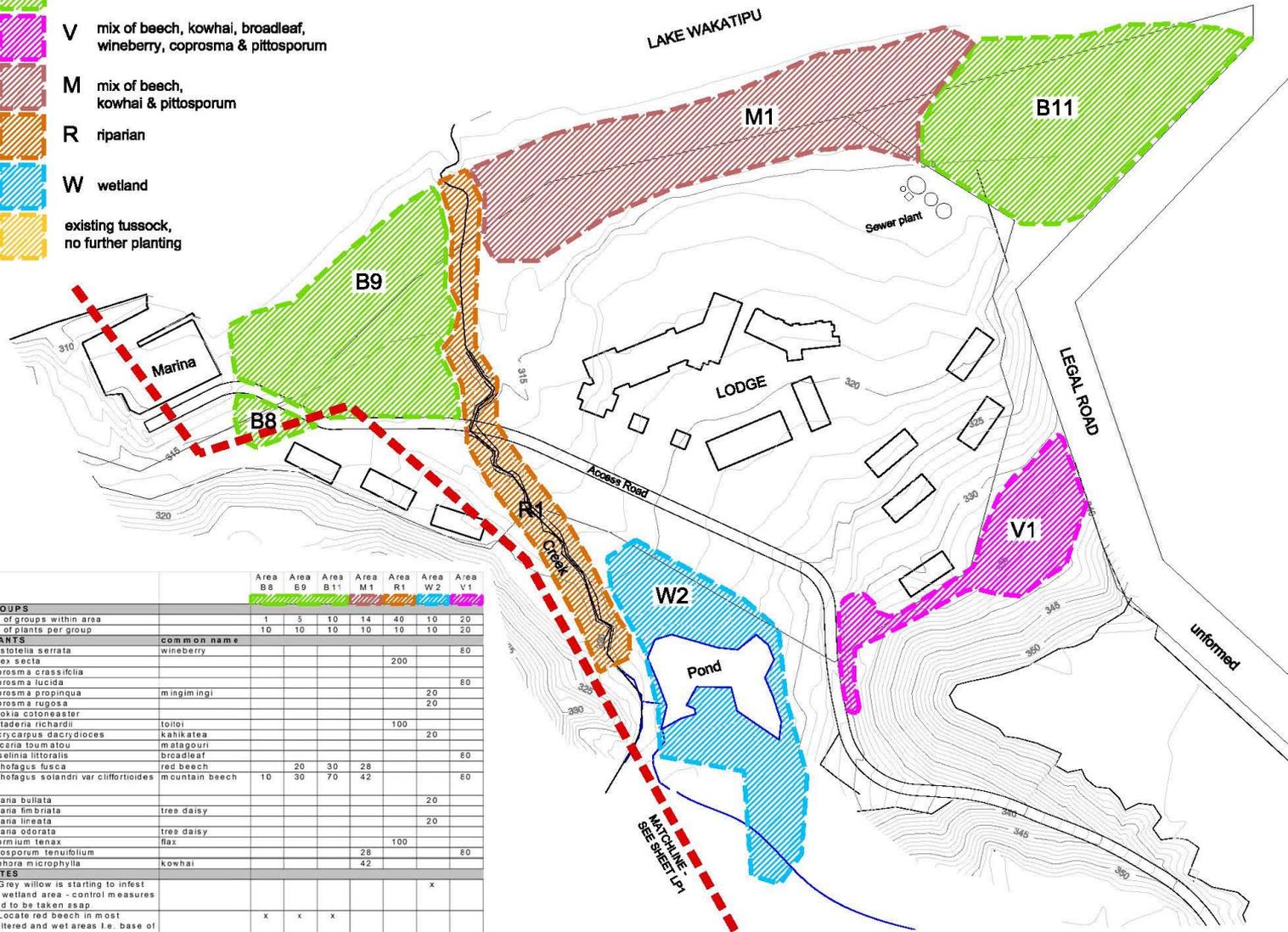
Following three years of growth a review of planting progress will be undertaken and an assessment made to determine if 70% of the new plantings have established. If less than 70% of the plants have survived, a programme of infill planting will be undertaken. The scale and nature of infill planting will be assessed should this be required and approval sought from the QLDC.



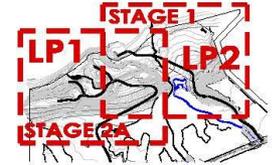
Figures

# LEGEND

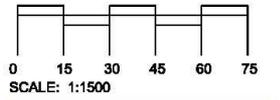
- B beech
- V mix of beech, kowhai, broadleaf, wineberry, coprosma & pittosporum
- M mix of beech, kowhai & pittosporum
- R riparian
- W wetland
- existing tussock, no further planting



	Area B8	Area B9	Area B11	Area M1	Area R1	Area W2	Area V1
<b>GROUPS</b>							
No. of groups within area	1	5	10	14	40	10	20
No. of plants per group	10	10	10	10	10	10	20
<b>PLANTS</b>	<b>common name</b>						
<i>Aristotelia serrata</i>	wineberry						60
<i>Carex secta</i>					200		
<i>Coprosma crassifolia</i>							60
<i>Coprosma lucida</i>							20
<i>Coprosma propinqua</i>	mingimingi						20
<i>Coprosma rugosa</i>							60
<i>Corokia cotoneaster</i>							
<i>Cortaderia richardii</i>	toitoi			100			
<i>Dacrydium dacrydioides</i>	kahikatea					20	
<i>Discaria toumatou</i>	m atapouri						
<i>Griseelinia littoralis</i>	broadleaf						60
<i>Nothofagus fusca</i>	red beech		20	30	28		
<i>Nothofagus solandri</i> var <i>cliffortioides</i>	mountain beech	10	30	70	42		60
<i>Olearia bullata</i>							20
<i>Olearia fimbriata</i>	tree daisy						20
<i>Olearia lineata</i>							20
<i>Olearia odorata</i>	tree daisy						100
<i>Phormium tenax</i>	flax						28
<i>Pittosporum tenuifolium</i>							42
<i>Sophora microphylla</i>	kowhai						
<b>NOTES</b>							
A: Grey willow is starting to infest the wetland area - control measures need to be taken asap							x
B: Locate red beech in most sheltered and wet areas i.e. base of banks	x	x	x				
C: Beech tree groups to be located to maintain view corridors from lodge platform building	x	x	x	x			
E: Remove willow once beech established					x		
F: Control of broom	x	x	x	x			x
G: Control of Himalayan Honeysuckle							x



ATTACHMENT 3  
LP2



**Notes:**  
Verify all dimensions on site. Do not scale from this plan. Ensure all construction complies with New Zealand Standards, rules and regulations. All drawings to be read in conjunction with Architectural, Survey and Structural Engineering plans and specifications. Alert all discrepancies to the Landscape Architect prior to construction.



**Project:**  
WALTER PEAK

**Title:**  
ECOLOGICAL PLANTING STRUCTURE STAGE 1

**Location:**  
WALTER PEAK, QUEENSTOWN

Rev	Description	By	Date
A	plant revisions	JD	19.07.13
B	plant revisions	JD	02.09.13

**Scale:**  
1:1500

**Job No:**  
2465

**Drawn / Checked:**  
JD / RL

**Date:**  
05.10.12

**Drawing No:**  
LP2B

This drawing is supplied on the understanding that the information herein will not be passed to any other party without written permission first being obtained from LAND Ltd.

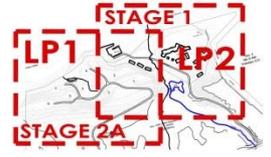


Figure 1: Stage 1 Planting and Maintenance Plan

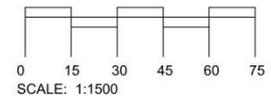
	Area B1	Area B2	Area B3	Area B4	Area B6	Area B7	Area G1	Area G2	Area G3	Area G4	Area K1	Area K2	Area K3	Area K4	Area K5	Area W1
<b>GROUPS</b>																
No. of groups within area	5	5	4	5	7	4	10	9	18	40	1	1	1	1	2	10
No. of plants per group	25	25	25	25	25	25	25	25	25	25	5	5	5	5	5	25
No. of plants per group at larger grade	5	6	7	7	7	5										
<b>PLANTS</b>	<b>common name</b>															
Carex secta																100
Coprosma crassifolia							25	21	45	100						
Coprosma lucida																
Coprosma propinqua	mingimingi						25	21	45	100						
Coprosma rugosa							25	24	45	100						
Corokia cotoneaster							25	24	45	100						
Cortaderia richardii	toitoi															25
Dacrycarpus dacrydiodes	kahikatea															
Discaria toumatou	matagouri						50	45	90	200						
Nothofagus fusca	red beech															
Nothofagus solandri var cliffortioides	mountain beech	125	125	100	125	175	100									
Olearia bullata																25
Olearia fimbriata	tree daisy						50	45	90	200						
Olearia lineata																25
Olearia odorata	tree daisy						50	45	90	200						
Phormium tenax	flax															50
Pittosporum tenuifolium																
Sophora microphylla	kowhai										5	5	5	5	10	25
Tussock varieties																
<b>NOTES</b>																
A: Grey willow is starting to infest the wetland area - control measures need to be taken asap.																
D: Group sizes will be 25m2 with a total of 25 plants at 1.0m crs.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

**LEGEND**

-  W wetland
-  B beech
-  existing grey shrubland, no further planting
-  G grey shrubland
-  existing tussock, no further planting
-  K kowhai



**ATTACHMENT 3  
LP1**



**Notes:**  
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**Project:**  
WALTER PEAK

**Title:**  
ECOLOGICAL PLANTING STRUCTURE STAGE 2A

**Location:**  
WALTER PEAK, QUEENSTOWN

Rev	Description	By	Date
A	plant revisions	JD	22.07.13
B	plant revisions	JD	02.09.13

**Scale:** 1:1500 **Job No:** 2465

**Drawn / Checked:** RB / JD **Date:** 05.10.12

**Drawing No:** LP1B

This drawing is supplied on the understanding that the information herein will not be passed to any other party without written permission first being obtained from LAND Ltd.



**Figure 2: Stage 2a Planting and Maintenance Plan**



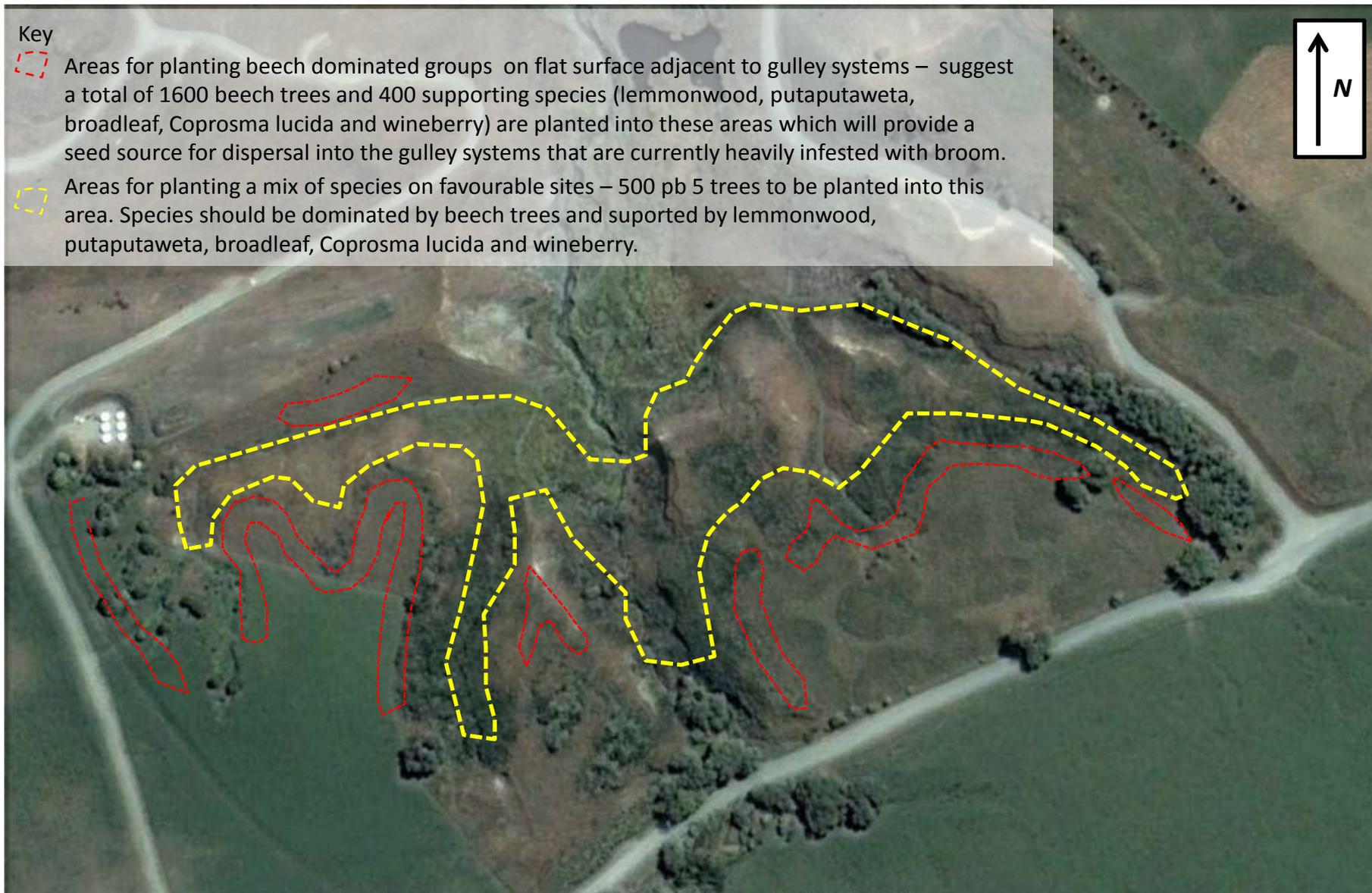


Figure 3: Stage 2b Planting and Maintenance Plan



Figure 4: Stage 2c Planting and Maintenance Plan

**LEGEND**

-  B beech
-  V mix of beech, kowhai, broadleaf, wineberry, coprosma & pittosporum
-  M mix of beech, kowhai & pittosporum
-  R riparian
-  W wetland
-  existing tussock, no further planting

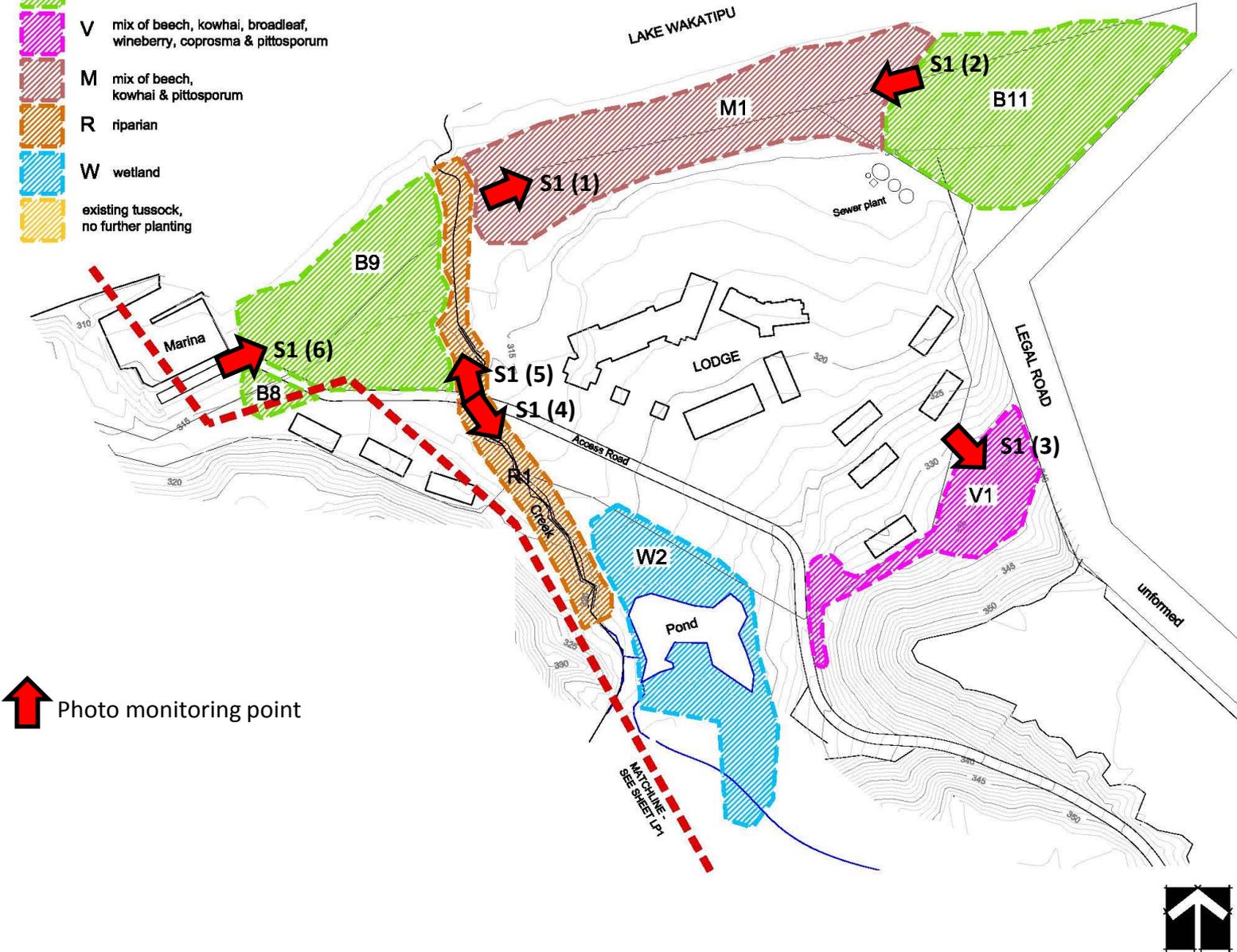
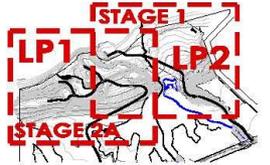
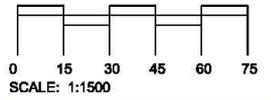


 Photo monitoring point



ATTACHMENT 3  
LP2



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**Project:**  
WALTER PEAK

**Title:**  
ECOLOGICAL PLANTING STRUCTURE STAGE 1

**Location:**  
WALTER PEAK, QUEENSTOWN

Rev	Description	By	Date
A	plant revisions	JD	19.07.13
B	plant revisions	JD	02.09.13

**Scale:**  
1:1500

**Drawn / Checked:**  
JD / RL

**Job No:**  
2465

**Date:**  
05.10.12

**Drawing No:**  
LP2B

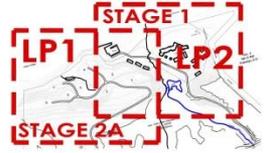


Figure 6: Stage 1 Photo Monitoring Point Locations

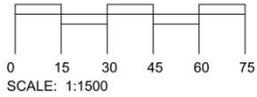
Figure 7: Stage 2a Photo Monitoring Point Locations

**LEGEND**

-  W wetland
-  B beech
-  existing grey shrubland, no further planting
-  G grey shrubland
-  existing tussock, no further planting
-  K kowhai



ATTACHMENT 3  
LP1



**Notes:**  
Verify all dimensions on site. Do not scale from this plan. Ensure all construction complies with New Zealand Standards, rules and regulations. All drawings to be read in conjunction with Architectural, Survey and Structural Engineering plans and specifications. Alert all discrepancies to the Landscape Architect prior to construction.



Project:  
WALTER PEAK

Title:  
**ECOLOGICAL PLANTING STRUCTURE STAGE 2A**

Location:  
WALTER PEAK, QUEENSTOWN

Rev	Description	By	Date
A	plant revisions	JD	22.07.13
B	plant revisions	JD	02.09.13

Scale:  
1:1500

Job No:  
2465

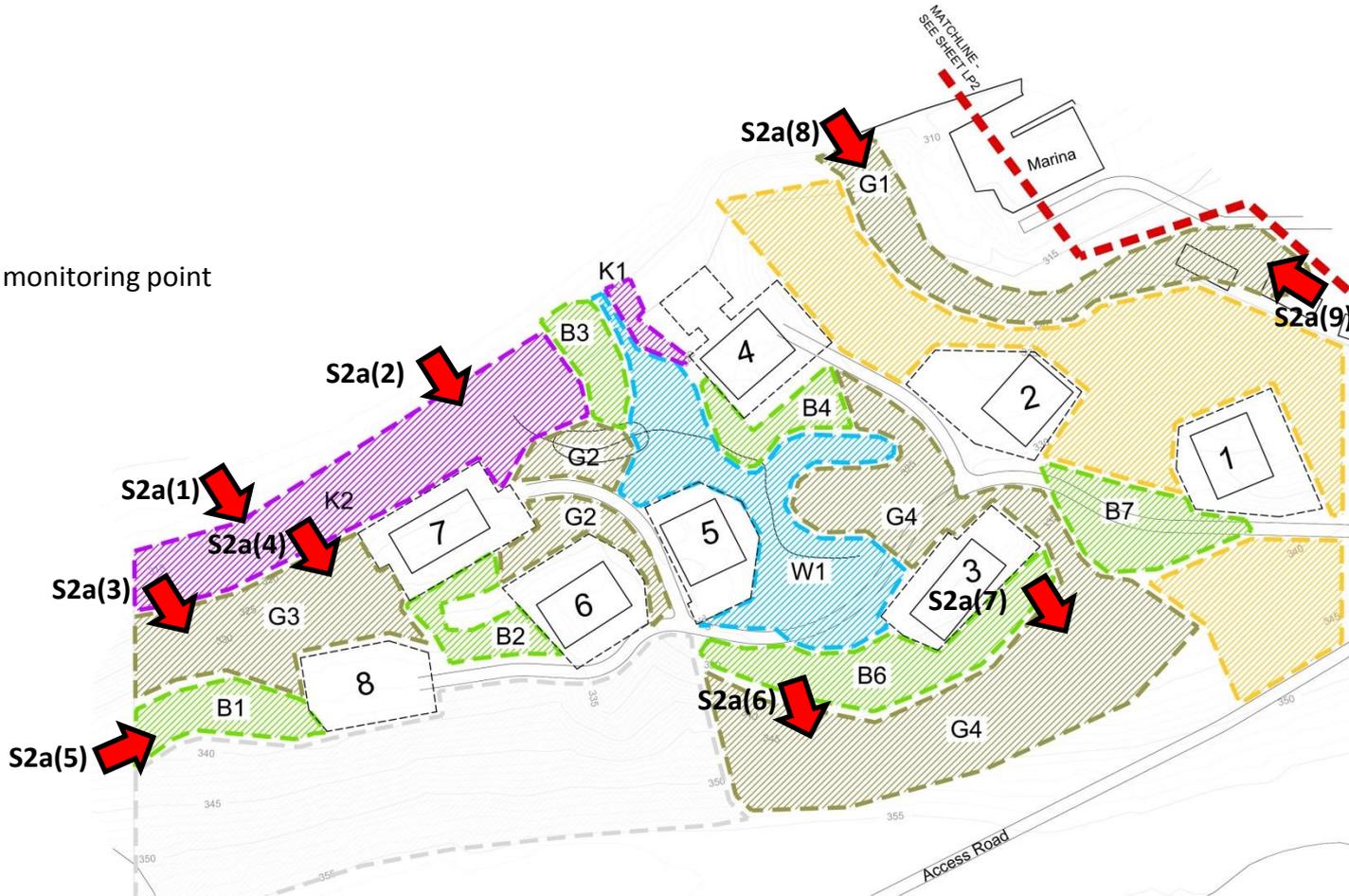
Drawn / Checked:  
RB / JD

Date:  
05.10.12

This drawing is supplied on the understanding that the information hereon will not be passed to any other party without written permission first being obtained from LAND Ltd.

Drawing No:  
**LP1B**

 Photo monitoring point



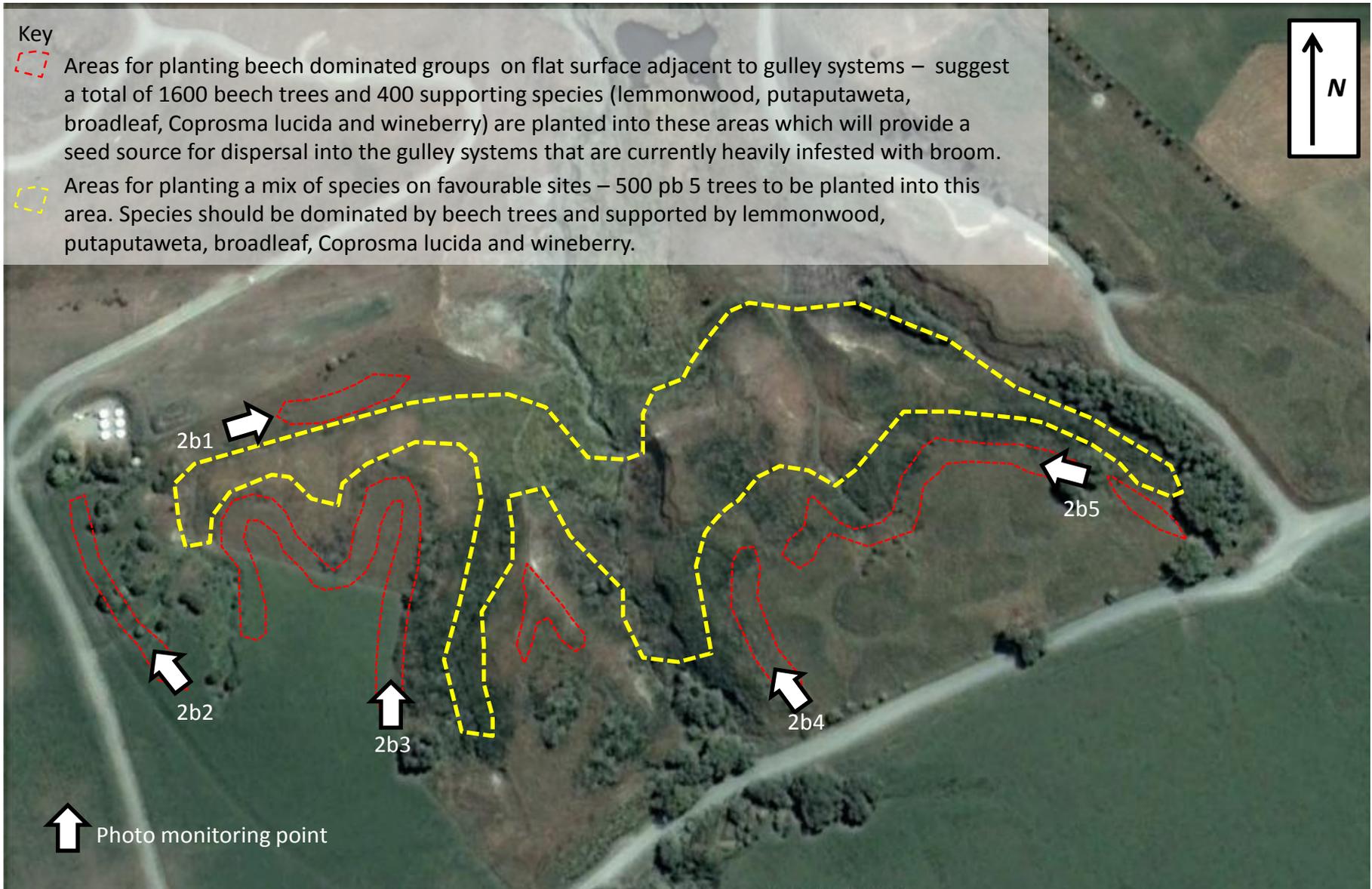


Figure 8: Stage 2b Photo Monitoring Point Locations



Figure 9: Stage 2c Photo Monitoring Location Plan

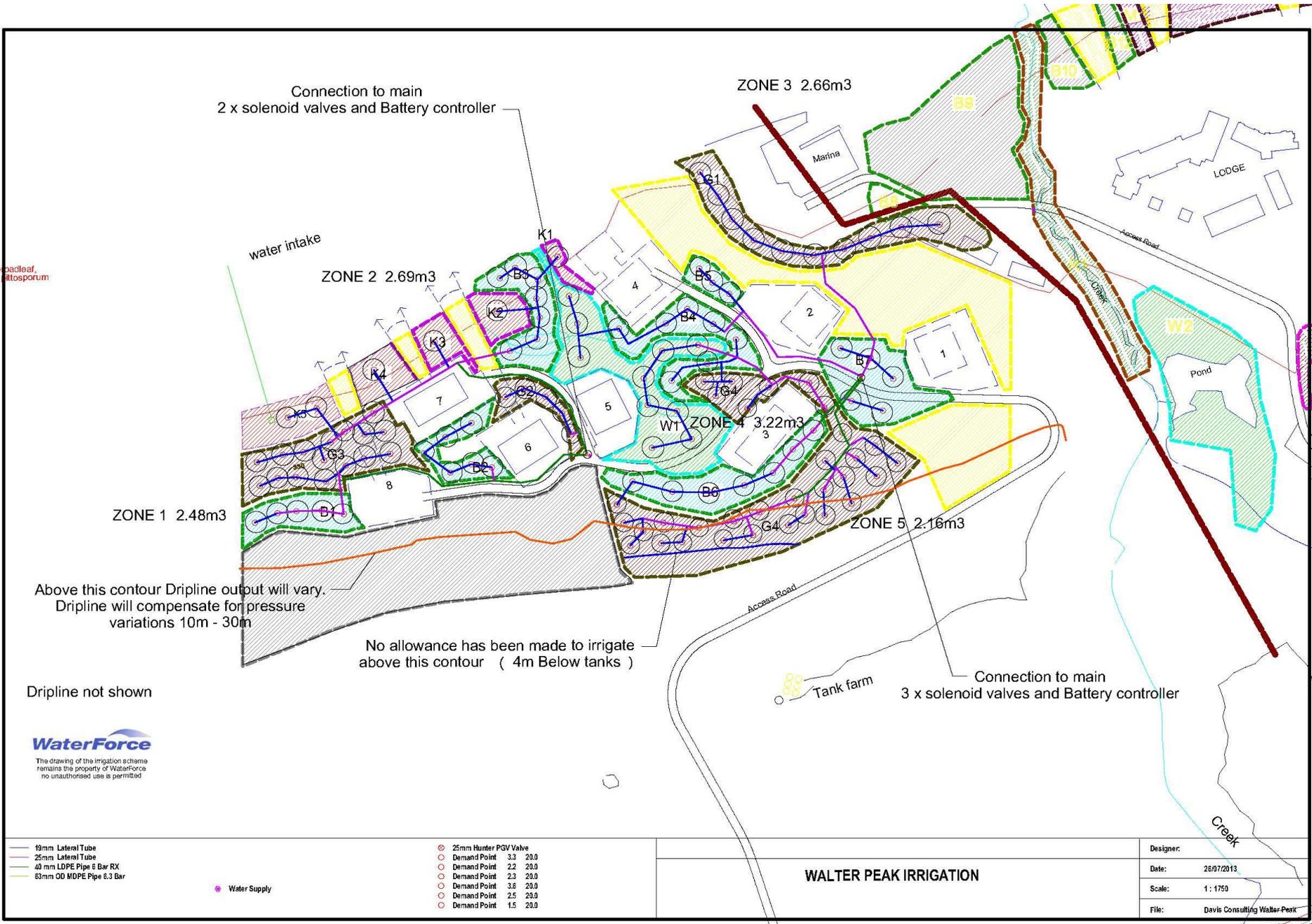


Figure 10: Irrigation Plan

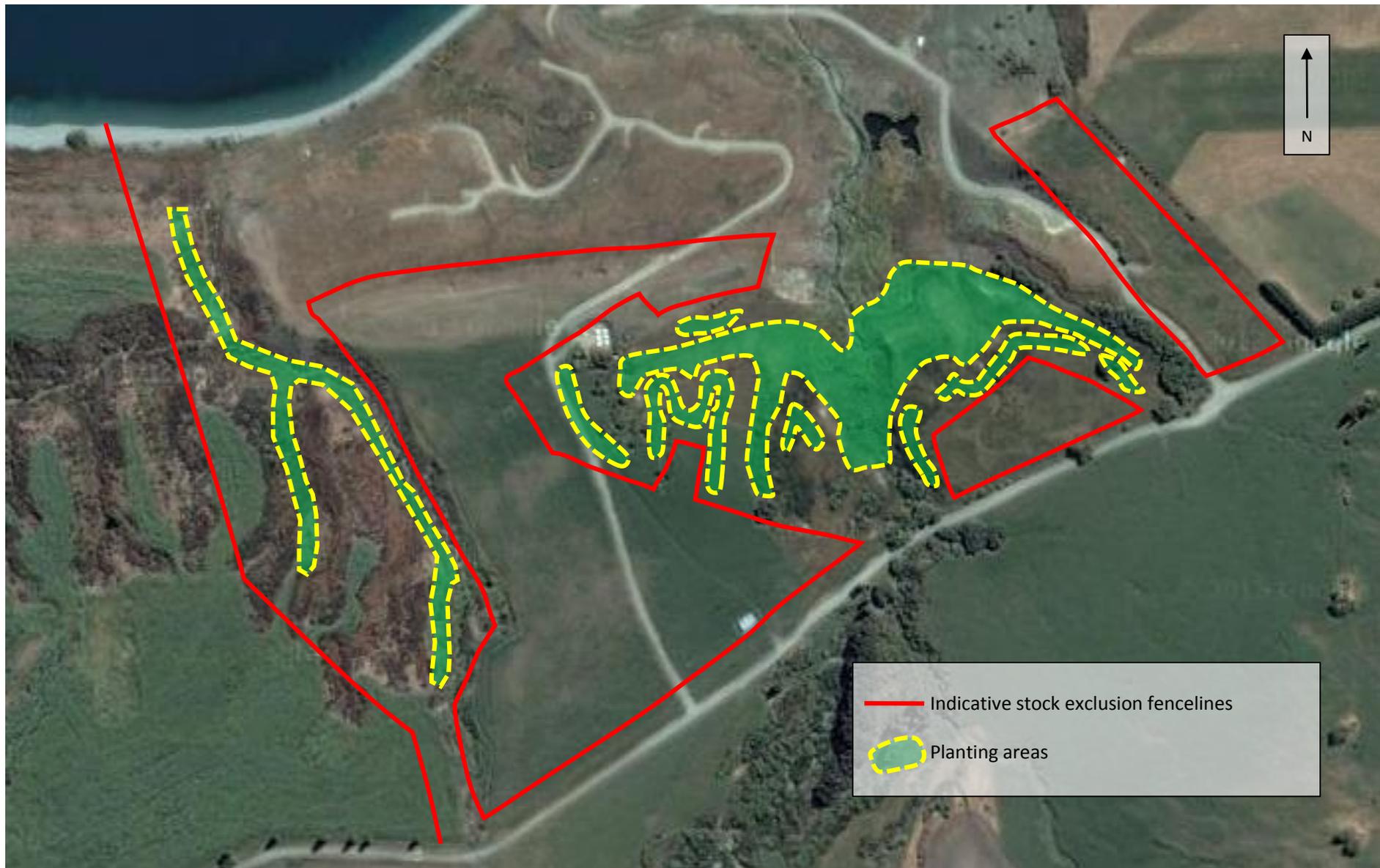


Figure 11: Indicative Grazing Area Plan

Attachment B - Landscape Management Plan 438 Malaghans Road,  
Queenstown



5 March, 2015

Queenstown Lakes District Council  
Private Bag 50072  
Queenstown 9348

**Re: Landscape Management Plan for RM090590, at 438 Malaghans Rd, Queenstown –  
Highground Trust Ltd**

In accordance with condition 4 viii of RM090590, please find enclosed for approval the Landscape Management Plan (LMP) for Resource Consent RM 090590, at 438 Malaghans Road, Queenstown.

The LMP documents the planting programme to be undertaken. The programme is consistent with the Landscape Concept Plan (i.e. the Landscape Concept and Fences Plan, Revision L2D dated 14.10.09) subject to some slight modifications to the original planting plan to improve the plant mix and make the revegetation programme more robust. The modifications are shown on Landscape Plan L3 in the LMP and include:

- Increase in the size of 'Summit Plateau: Gullies' planting in Lot 4;
- Slight increase in the area of poplar planting in Lot 1;
- Rearrangement of poplar planting at the entrance to the site in Lot 3; and
- Some refinement of the plant species to be planted.

We ask that you please review and approve the LMP as submitted. If you wish to discuss any aspects of the LMP, please contact Davis Consulting Group.

Yours sincerely,

A handwritten signature in black ink, consisting of a stylized 'G' and 'D' followed by the name 'Davis' written in a cursive script.

Glenn Davis.

Principal Environmental Scientist

Landscape Management Plan  
438 Malaghans Road, Queenstown

*For*

Highground Trust Limited



*February 2015*



*Davis Consulting Group Limited  
Arrow Lane, Arrowtown 9302  
03 409 8664  
Document ID: 14066*

**Landscape Management Plan  
438 Malaghans Road**

**Document Status**

<b>Version</b>	<b>Purpose of Document</b>	<b>Prepared By</b>	<b>Reviewer</b>	<b>Review Date</b>
A	Draft for review	RL	GD	12 December 2014
B	Draft for client review	RL	GD	20 February 2015
O	FINAL	RL	GD	27 February 2015

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## TABLE OF CONTENTS

	<b>Page No.</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
1.1 Overview	1
1.2 Scope of the Ecological Documentation	1
<b>2.0 PLANTING PREPARATION, INSTALLATION AND MAINTENANCE</b>	<b>2</b>
2.1 Planting Preparation	2
2.2 Plant Installation	2
2.3 Maintenance of Planting	5
<b>3.0 PROJECT PERFORMANCE OBJECTIVES AND MEASUREMENT CRITERIA</b>	<b>6</b>
3.1 Objectives	6
3.2 Measurement Criteria	6
3.2.1 Objective Assessment of Landscape and Restoration Planting Performance	7
<b>4.0 IMPLEMENTATION STRATEGY</b>	<b>9</b>
4.1 Measures to Ensure Achievement of Project Performance Criteria	9
4.1.1 Project planning & management	9
4.1.2 Planting procedures	10
4.1.3 Planting maintenance	10
4.1.4 Pest protection	11
4.1.5 Irrigation Maintenance	11
4.2 Audit and Performance Review	11
4.2.1 Annual Audit	11
4.2.2 Audit at Year Three	12

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## LIST OF FIGURES

<b>Figure No.</b>		<b>Page No.</b>
1	Landscape Concept Plan for 438 Malaghans Road	3
2	Photo monitoring points and direction.	14

## LIST OF APPENDICES

<b>Appendix A</b>	Planting Species and Numbers for Each Environment
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## **1.0 INTRODUCTION**

### **1.1 Overview**

Highground Trust Limited (HTL) is in the planning phase of implementing consent conditions associated with subdivision consent RM090590. Consent condition 4 viii requires a planting plan, specification and maintenance schedule to be submitted to Council for approval prior to commencement of any planting on site. In order to address this consent condition Highground Trust Limited (HTL) has engaged Davis Consulting Group Limited (DCG) to oversee the implementation of the planting and maintenance work and prepare all documentation to satisfy all associated consent conditions.

This Landscape Management Plan (LMP) has been prepared to guide the implementation of the HTL subdivision landscape activities and addresses all items included in consent condition 4 viii. The LMP is a living document that should be updated annually to reflect the performance of the plantings and meet any additional challenges that are currently not foreseeable.

### **1.2 Scope of the Ecological Documentation**

The LMP documentation is set out as follows:

Section 2: Details the planting and maintenance programme for all plantings;

Section 3: Documents project performance objectives and measurement criteria; and

Section 4: Presents an implementation strategy designed to ensure that appropriate management measures are implemented to achieve the planting performance goals.

## 2.0 PLANTING PREPARATION, INSTALLATION AND MAINTENANCE

The following section documents the planting programme to be undertaken. The planting programme shall be undertaken in accordance with the Landscape Concept Plan provided in Figure 1.

### 2.1 Planting Preparation

Preparation of the planting sites is required prior to the installation of the plants in the planting areas. The preparation will involve the removal and/or control of woody weeds such as broom, gorse and hawthorn, and the application of herbicide onto the planting areas to assist the installation of the plants.

In addition to the weed control work, all planted areas will be fenced and rabbit proof netting installed to mitigate the risk of damage to plants from rabbit browse. The extent of the required fencing is shown on the Landscape Concept Plan. The final fencing and cattle stop arrangement will be resolved in conjunction with the detailed road design for the subdivision.

### 2.2 Plant Installation

The Landscape Concept Plan identified five environments on the site that are suitable for the planting of a range of native species mixes. A total 23,001 native plants will be planted into these five environments, with an additional 111 poplars also planted onto the property. All planting will be completed in late winter/spring 2015 and all plants will be installed with plant shelters and irrigation to maximise the performance of the landscape plantings. The planting detail for each environment is provided in Appendix A and is summarised below.

It is important to note that the staged planting envisaged by the consent will in fact all occur in the first year of planting. This is being done to maximise the effectiveness of the planting programme.

#### *Northerly Faces Gullies*

A total of 2881 plants will be planted into shallow gullies on the north facing slopes of the property. The northern faces planting mix has been developed to support the development of shrubland communities. The species mix will include *Coprosma propinqua*, *Coprosma rigida*, *Coprosma rugosa*, *Cordyline australis*, *Discaria toumatou*, *Griselinia littoralis*, *Olearia odorata*, *Hebe salicifolia*, *Pittosporum tenuifolium*, *Leonohebe cupressoides*, *Olearia bullata*, *Olearia lineata*, *Olearia hectorii*, *Olearia avicenniifolia* and *Sophora microphylla*. The plants will be a V150 grade and planted at 1 m centres.

#### *Summit Plateau: Tarn*

A total of 6833 plants will be planted adjacent to and surrounding the four tarns located on the site. The 'summit plateau: tarn' planting mix has been developed to support the development of wetland planting that grades into shrubland communities. The species mix will include *Aristotelia fruticosa*, *Carex secta*, *Carex virgata*, *Chionochloa rubra*, *Austroderia richardii*, *Juncus edgariae*, *Juncus pallidus*, *Coprosma propinqua*, *Coprosma rugosa*, *Coprosma tayloriae*, *Discaria toumatou*, *Hebe salicifolia*, *Olearia bullata*, *Olearia lineata*, *Olearia hectorii*, *Olearia avicenniifolia*, and *Festuca novae-zealandiae*. The plants will be a V150 grade and planted at 1 m centres.

#### *Summit Plateau*

A total of 4834 plants will be planted on the gently sloping ground of the summit plateau. The species mix will include *Carmichaelia petriei*, *Festuca novae zealandiae*, *Melicytus alpinus*, *Olearia odorata*, *Sophora microphylla*, *Poa cita*, *Coprosma crassifolia*, *Coprosma tayloriae*, *Coprosma virescens*, *Corokia cotoneaster* and *Coprosma propinqua*. The plants should be at 1 m centres and V150 grade, except *C. petriei*, which will be a 1 litre pot grade.

#### *Summit Plateau: Gullies*

A total of 2441 plants will be planted in shallow gullies on the summit plateau. The species mix will include *Coprosma propinqua*, *Cordyline australis*, *Poa cita*, *Chionochloa rubra*, *Myrsine divaricata*, *Leptospermum scoparium* and *Phormium cookianum*. The plants should be at 1 m centres and will be V150 grade, except *P. cookianum*, which will be a V310 grade.

#### *Southerly Faces*

A total of 6012 plants will be planted on the south facing slopes of the site. The southerly faces planting mix has been developed to support the development of beech forest on the southerly faces. The species mix will include *Olearia avicenniifolia*, *Coprosma tayloriae*, *Aristotelia fruticosa*, *Myrsine divaricate*, *Carpodetus serratus*, *Coprosma linariifolia*, *Coprosma lucida*, *Nothofagus fusca*, *Nothofagus solandri var. cliffortioides*, *Podocarpus cunninghamii*, *Pseudopanax colensoi var. ternatus*, *Pseudopanax crassifolius*, *Coprosma propinqua*, *Griselinia littoralis*, *Pittosporum tenuifolium*, and *Cyathodes juniperina*. The plants should be at 1 m centres and will be V150 grade, except the *Nothofagus* species and *P. cunninghamii*, which will be in 1 Litre pots, and the *C. juniperina*, which will be in a V310 grade.

#### *Poplar Planting*

A total of 111 poplar trees are to be planted in the areas identified on Landscape Concept Plan L3.



### **2.3 Maintenance of Planting**

At the completion of the planting work an irrigation system will be installed to all plants other than those in landscape depressions and adjacent to the four tarns. Once the irrigation system has been designed, irrigation plans will be lodged with the Council if required.

A landscape planting maintenance programme will commence upon the completion of the planting work. The plant maintenance work to be undertaken is detailed below.

#### *Weed Control*

Weed control to minimise competition with the plantings will be undertaken. Weed control will consist of spraying immediately adjacent to each plant and hand pulling of weeds that grow within the plant shelter. In addition, woody weed control across the whole property will be undertaken including the spraying and hand chopping of broom, gorse, hawthorn and any other species that are undesirable on the property.

#### *Fencing and Plant Shelter Maintenance*

Inspection and maintenance of all stock and rabbit proof fences and plant shelters will be undertaken to ensure all fences and shelters are working effectively.

#### *Additional Planting*

A low level of failure is expected in all landscape and restoration plantings. Providing 70% of the plants survive through the first three years after installation the plantings should be considered a success and infill planting is unlikely to be necessary. We note however that infill planting will be undertaken as part of the plant maintenance program if losses exceeding 30% occur.

### **3.0 PROJECT PERFORMANCE OBJECTIVES AND MEASUREMENT CRITERIA**

#### **3.1 Objectives**

The overall objective of the landscape work is to establish a range of ecological communities that are representative of vegetation present in the Wakatipu Basin prior to settlement of the area. Specific ecological benefits that will occur if this overall objective is achieved include:

- Significantly increase the diversity of native species on the site and reduce weed dominance;
- Provide habitat for a range of native invertebrates, skinks, geckos and birds;
- Establish plantings that have the ability to self-sustain themselves by seeding both within the development and providing a seed source for the wider area; and
- Establishing a node of ecological diversity that will be an important contribution to the wider community goal of restoring biodiversity values within the Wakatipu Basin.

#### **3.2 Measurement Criteria**

All plantings detailed in the Landscape Concept Plan shall meet the following criteria:

- By the end of 2015, all plantings (as described in Section 2 and shown in Figure 1) shall be completed;
- A total of 70% plant survival shall be achieved three years after installation.
- The five native plant communities (i.e. Northerly Faces: Gullies, Summit Plateau, Summit Plateau: Tarn Surroundings, Southerly Faces and Summit Plateau: Gullies) shall be established (requiring only minor maintenance work) within five years of planting, and become self-sustaining on the site within 10 years of planting, including the capacity to support associated native invertebrates, lizards and birds.

Failure to achieve the measurement criteria shall trigger a review of the planting programme (see Section 2) and implementation strategy (Section 4), to determine if additional measures are required.

### 3.2.1 Objective Assessment of Landscape and Restoration Planting Performance

In order to objectively determine measurement criteria have been met, an inventory of the percentage indigenous vegetation cover will be recorded over time for each planted landscape area. An estimation of percentage vegetation cover within each plant community will be recorded from the same location point each year. Permanent photo points shall be established to support the assessment (see Figure 2).



## 4.0 IMPLEMENTATION STRATEGY

### 4.1 Measures to Ensure Achievement of Project Performance Criteria

The overall objective of the project is the establishment of self-sustaining areas of native vegetation communities including wetlands, tussock grassland, shrubland and beech forest. The implementation strategy to achieve this objective is set out in detail below.

#### 4.1.1 Project planning & management

The planning and management for the landscape works are outlined below:

- The DCG project management team will oversee the project;
- DCG will select a landscape contractor to undertake all plantings and maintenance who has experience in implementing projects of this scale;
- DCG and/or Hadley Consultants will select a fencing contractor to install and maintain the stock and rabbit proof fence;
- An experienced irrigation professional will be engaged to design and install a dripper irrigation system. DCG will oversee the design and installation works;
- DCG will manage the supply of plants for the planting programme and ensure plants arrive onto the property at a time when the landscape contractor is ready to plant. This will minimise the time plants will be onsite before planting occurs.
- DCG will ensure the implementation of the landscape management plan as set out in Figure 1 (i.e. planting, maintenance, performance assessment and auditing), with allowance for changes to occur based on project progress;
- All planting will occur with plants of appropriate size (V150, 1 Litre or V310, as detailed in Section 2), being eco-sourced where possible and planted at 1 m spacing;
- The species to be planted have been chosen based on the success of previous plantings and expert planting experience;
- The final species choice and planting locations are detailed in Section 2 and Figure 1;
- The landscape contractor will carry out all planting and maintenance to the standard expected by DCG (as outlined in the planting procedures and maintenance below); and
- The plantings and maintenance will be monitored for 5 years from the date of first planting.

#### 4.1.2 Planting procedures

The planting procedures to be followed are outlined below:

- Spraying of all planting areas shall be undertaken to kill off grasses and woody weeds such as broom;
- Before any planting occurs, stock and rabbit proof fencing will be installed around all five planting areas.
- An irrigation dripper system will be set up at the completion of the plantings to ensure all plants that require irrigation receive water.
- Plants of the correct species and size will be sourced by DCG.
- The plants must be appropriately transported to the site so that no unnecessary damage, dehydration or deterioration of the specimens occurs. DCG will manage this process with the nursery.
- Once onsite the plants shall be left in a sheltered location for no more than two weeks before planting.
- Plants must be transferred directly from bags/pots into their plant hole. Please note - plants shall not be removed from bags/pots and laid out while awaiting planting.
- All plants must be thoroughly watered prior to planting.
- Planting shall only occur in late winter/spring 2015.
- All plantings must be installed as per the group numbers, distances and location advised by DCG and shown on Figure 1.
- Plant shelters and weed mats shall be installed around all plants to reduce the risk of pest browse, assist with weed control and provide wind shelter.

The dripper irrigation system referred to above will be installed by experienced irrigation professionals. Once an irrigation plan has been designed for the site, it will be included within this LMP.

#### 4.1.3 Planting maintenance

On behalf of HTL, DCG will engage an experienced landscape maintenance contractor for the project. A contract will be put in place that provides for three/four contractors to undertake three weeks of maintenance per year, for a period of three years. Most of the maintenance effort will occur over the spring/early summer period when vegetative growth is most vigorous. In the event additional work is identified during routine monitoring of the project, the landscape maintenance contractor will be engaged to complete additional work if deemed necessary by the DCG.

Specific plant maintenance measures required to assist the establishment of plantings are listed below:

- Control of broom and other woody weeds is required in all areas.
- Re-planting will occur where any of the new plants have failed, but with consideration of why failure occurred and any adjustments made before replacement.
- Any additional maintenance that is identified through regular review of the project and quantification of planting performance (detailed in Section 3).

#### 4.1.4 Pest protection

The rabbit population within Dalefield is considered moderate to high. In order to mitigate this issue all new plants will be planted with protective shelters, as well as rabbit proof fencing installed before planting. Possum browse may be of a concern, therefore the plantings will be monitored and should possum browsing be identified, a management response will be implemented.

#### 4.1.5 Irrigation Maintenance

Maintenance of the irrigation system will be required to ensure all new plants are being watered effectively. The irrigation contractor will be responsible for maintaining the irrigation system and will be onsite at least twice during the early and late summer period when irrigation will be most critical. In addition, the DCG will check the irrigation system during dry periods to ensure the irrigation system is operating effectively and organise any required maintenance efforts.

## 4.2 **Audit and Performance Review**

### 4.2.1 Annual Audit

An audit of planting performance will be completed on an annual basis for the first three years. This audit is in addition to the quantification of planting performance outlined in Section 3.2.1. Providing the plantings are establishing in accordance with the performance criteria at the end of year 3, it may be possible to reduce the number of site audits to biennial after three years.

At a minimum, all audits shall record the following:

- The number of plants that have failed during the year;
- The number of each species that have failed during the year; and,
- Provide recommendations for any additional maintenance works required.

In addition to recording the above information, photographs of plantings shall be taken annually from defined locations to record plant development. Figure 2 provides a plan showing the location of photo monitoring points in each planting stage. The photos shall be taken in the direction shown on the plan.

Within one month of each audit a brief factual report shall be submitted to QLDC, which will include a summary of the three points listed above, as well as a summary of the quantification of planting performance outlined in Section 3.0. If performance criteria are not achieved the audit report shall review why this has occurred and what the mitigation efforts will be to improve performance.

#### 4.2.2 Audit at Year Three

Following three years of growth, the third annual audit will determine if subsequent bi-annual audits are appropriate.

Appendix A

Plant Species and Numbers in Each Environment

Species	Form	Pastoral shelter planting	Northerly faces: gullies		Summit plateau		Summit plateau: Tarn surroundings		Southerly faces		Summit plateau: Gullies		Total
		Total	Form	Total	Form	Total	Form	Total	Form	Total	Form	Total	
Poplar	Tree	111											111
Coprosma propinqua	Shrub		Shrub	304	Shrub	951	Shrub	341	Shrub	282	Shrub	355	2233
Coprosma rigida	Shrub		Shrub	200									200
Coprosma rugosa	Shrub		Shrub	288			Shrub	342					630
Cordyline australis	Tree		Tree	288							Tree	439	727
Discaria toumatou	Shrub		Shrub	99			Shrub	99					198
Griselinia littoralis	Shrub		Shrub	99					Shrub	99			198
Hebe salicifolia	Shrub		Shrub	288			Shrub	342					630
Olearia odorata	Shrub		Shrub	288	Shrub	967							1255
Pittoporum tenifolium	Shrub		Shrub	288					Shrub	198			486
Sophora microphylla	Shrub		Shrub	288	Shrub	484							772
Leonohebe cupressoides	Shrub		Shrub	89									89
Olearia bullata	Shrub		Shrub	75			Shrub	75					150
Olearia lineata	Shrub		Shrub	74			Shrub	217					291
Olearia hectorii	Shrub		Shrub	144			Shrub	315					459
Olearia avicenniaefolia	Shrub		Shrub	69			Shrub	87	Shrub	35			191
Carmichaelia petriei	Shrub				Shrub	300							300
Festuca novae zealandiae	Tuss				Tuss	127	Tuss	825					952
Poa cita	Tuss				Tuss	342					Tuss	516	858
Melicytus alpinus	Shrub				Shrub	653							653
Coprosma crassifolia	Shrub				Shrub	348							348
Coprosma tayloriae	Shrub				Shrub	201	Shrub	68	Shrub	25			294
Coprosma virescens	Shrub				Shrub	100							100
Corokia cotoneaster	Shrub				Shrub	361							361
Carex secta	Sedge						Sedge	542					542
Carex virgata	Sedge						Sedge	484					484
Chionochloa rubra	Tuss						Tuss	594			Tuss	548	1142
Austroderia richardii	Sedge						Sedge	387					387
Cyathodes juniperina	Shrub								Shrub	90			90
Aristolelia fruticosa	Shrub						Shrub	65	Shrub	65			130
Myrsine divaricata	Shrub								Shrub	119	Shrub	141	260
Juncus edgariae	Rush						Rush	1025					1025
Juncus pallidus	Rush						Rush	1025					1025
Carpodetus serratus	Sm tree								Sm tree	198			198
Coprosma linariifolia	Sm tree								Sm tree	198			198
Coprosma lucida	Shrub								Shrub	198			198
Northofagus fusca	Tree								Tree	1226			1226
Northofagus solandri var cliffortioides	Tree								Tree	2685			2685
Podocarpus cunninghamii	Conifer								Conifer	198			198
Pseudopanax colensoi var. ternatus	Sm tree								Sm tree	198			198
Pseudopanax crassifolius	Sm tree								Sm tree	198			198
Leptospermum scoparium var. scoparium	Shrub										Shrub	100	100
Phormium cookanum	Flax										Flax	342	342
<b>Total</b>		<b>111</b>		<b>2881</b>		<b>4834</b>		<b>6833</b>		<b>6012</b>		<b>2441</b>	<b>23112</b>