

# Review of Ecological Values and Restoration Opportunities for Dalglish Farm

*For*

Millbrook Country Club Ltd

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## Ecological Assessment of Plan Change for Dalgleish Farm

### Document Status

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## **1.0 INTRODUCTION**

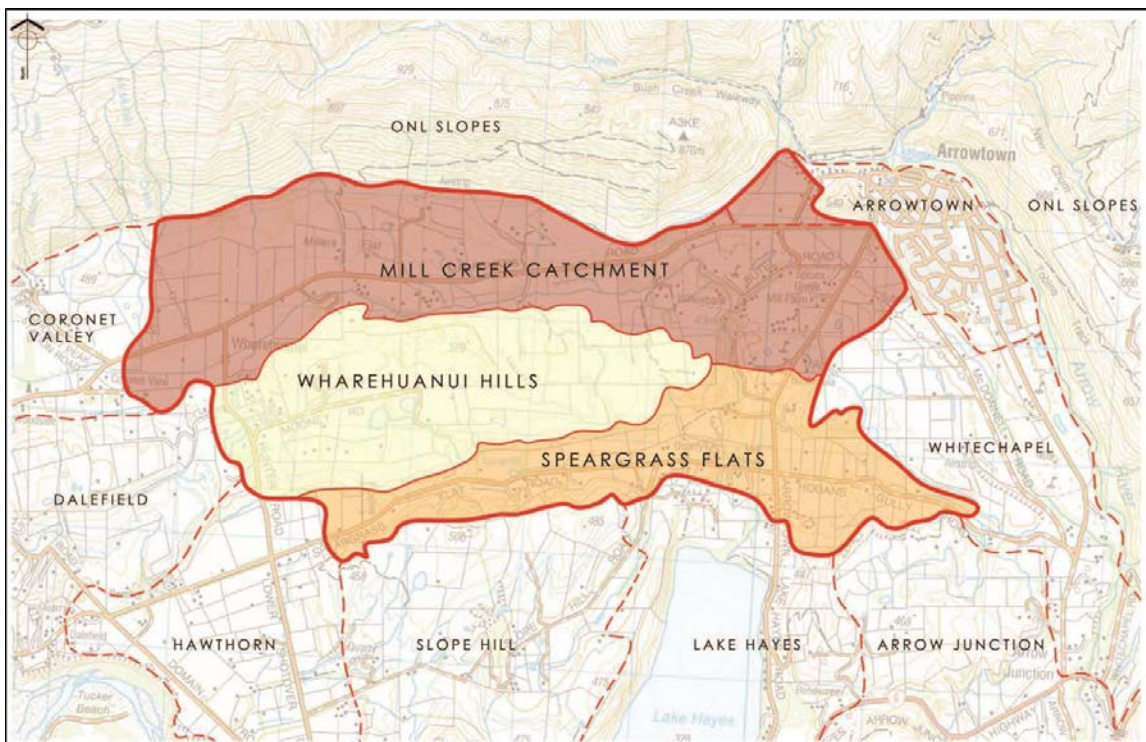
Millbrook Country Club Ltd (MCC) has recently purchased Dalgleish Farm to the west of Millbrook Resort and is undertaking investigations to support a plan change that would enable the development of up to 50 residential houses and nine golf holes over an area of 66.8 hectares. As part of the redevelopment, Millbrook proposes to undertake ecological restoration work in order to support existing ecological values and make a contribution to improving the natural heritage on the property and the wider Wakatipu Basin. In order to examine the risks and potential ecological benefits of the proposed development, MCC commissioned consulting ecologists Davis Consulting Group Limited (DCG) to undertake a detailed assessment of the existing values and explore the ecological restoration opportunities for the site.

This ecological review is set out as follows:

- Section 2: Documents the ecological context of the study area and the existing ecological values;
- Section 3: Examines ecological restoration opportunities, presents a plan showing a possible ecological restoration concept for the site and discusses the ecological benefits for the site and the Wakatipu Basin; and
- Section 4: Conclusions and recommendations.

## 2.0 EXISTING ENVIRONMENT

The study area for the ecological review is presented in Figure 1 and encompasses a north-eastern portion of the Wakatipu Basin described as the Wharehuanui Resource Study Area. The ecological context of this study area is described herein. The existing ecological values of the wider Arrowtown Basin are also described in order to inform the assessment of the biodiversity that is present in close proximity to the site and how restoration activities on the site can play a supporting role in maintaining and improving the natural heritage of the Wakatipu Basin.



**Figure 1:** Wharehuanui Resource Study Area (reproduced from Baxter Design Group, 2015)

### 2.1 Physical Environment

#### 2.1.1 Climate

The Wakatipu Basin has an almost continental climate due to its inland location and experiences the associated climatic extremes of relatively cold winters and hot summers (Meurk, 1997). The basin experiences high sunshine hours in the summer, while during winter the ground can be frozen, with snow falling but not settling for more than a few weeks (Meurk, 1997). Based on information provided on the GrowOtago website there is no strong seasonal variation in rainfall, with annual rainfall ranging from 700 – 900 mm/year.

The growing season is relatively short in comparison to more coastal locations. Frost events can still occur in late October/early November, while the high temperatures during summer

### 2.1.2 Landform and Geomorphology

The Wharehuanui Hills are bisected by numerous gullies, some of which are deeply incised. The erosion of these gullies has resulted in the development of alluvial fans that extend into the flood plain of Mill Creek. Figure 2 shows the range of landforms that are present within Dalgleish Farm. These landforms are representative of the geophysical environment of the wider Wharehuanui Resource study area.





## 2.2 Biological Environment

### 2.2.1 Flora and Vegetation

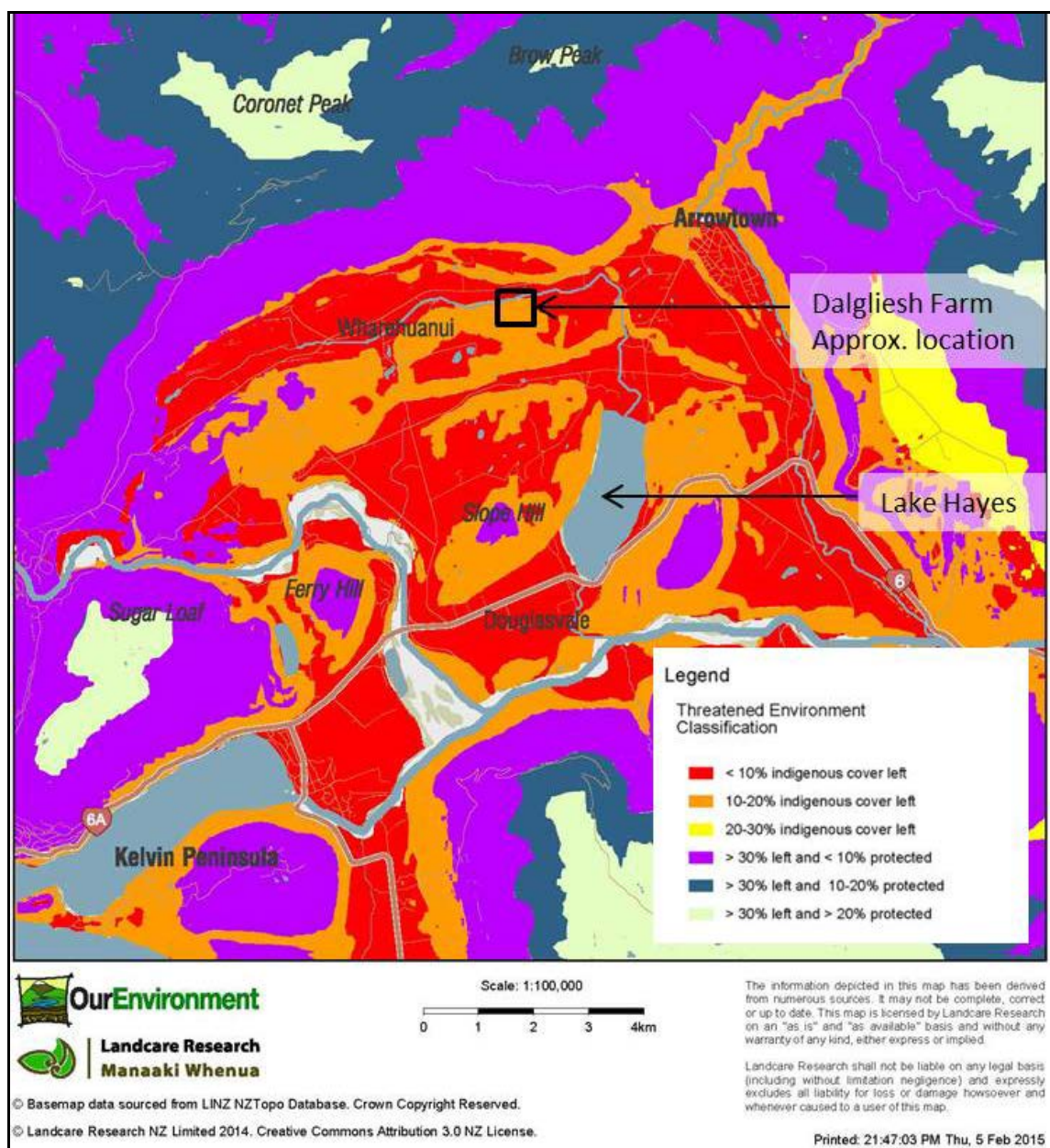
#### *Historical Vegetation*

The Wakatipu Basin has had a long history of pastoral activity that has resulted in almost the complete loss of indigenous ecosystems. Prior to human settlement the vegetation cover of the study area would have consisted of beech forest, shrubland, tussock grassland and wetland communities (Meurk, 1997). Within the study area DCG understands the gentle sloping ridge plateaus and slopes extending to the valley floor would have had a vegetation cover dominated by short tussock grassland consisting of hard tussock, silver tussock and *Elymus* spp., with shrubland communities of kowhai, coprosmas, tree daisies and matagouri present within gullies and around rocky outcrops. A number of small wetlands would also have been present in depressions on the higher ground, while the valley floor would have supported wetland systems dominated by sedges, rushes, toetoe and flax and shrubland consisting of tree daisies, coprosmas, kowhai, matagouri, native broom and manuka.

The significant loss of indigenous ecosystems within the Wakatipu Basin and other similar environments throughout the South Island has been recognised in the New Zealand threatened environment classification (TEC). Figure 3 presents the threatened environments within the Wakatipu Basin and shows the study area has less than 20% indigenous vegetation cover remaining. The TEC lists the remaining vegetation within these environments as chronically threatened, as biodiversity loss has been shown to accelerate when the area remaining reduces to below 20% of its original extent (Walker *et al.*, 2008).

Historical activities in the basin have resulted in the biological environment now being dominated by exotic pasture grasses and hedgerows within the rural zoned land. There are however small degraded remnants of indigenous communities that persist. The remnants that are present within the study area are described below.



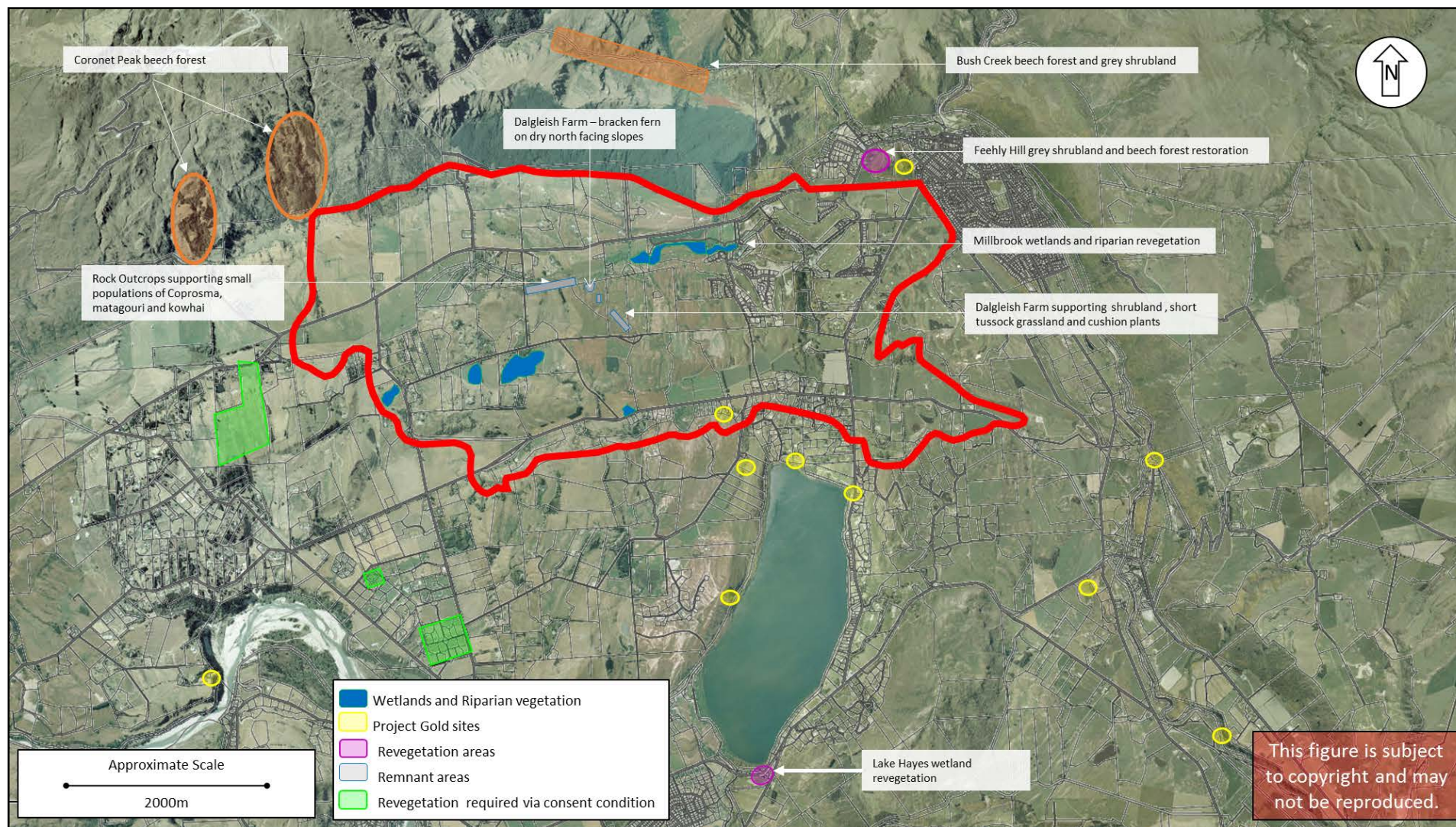


**Figure 3:** Threatened Environment Classification (reproduced from “Our Environment” website ([www.ourevironment.scinfo.org.nz](http://www.ourevironment.scinfo.org.nz)))

#### *Existing Indigenous Vegetation and Habitat*

Existing indigenous vegetation and habitat within the study area and neighbouring areas are shown in Figure 4. The largest indigenous ecosystem in the vicinity of the study area consists of beech forest remnants on the lower south facing slopes of Coronet Peak and shrubland communities within the catchment of Bush Creek. These areas house the greatest biodiversity values in the vicinity of the study area and support bird populations that will utilise habitat in the Wakatipu Basin largely for feeding purposes.





**Figure 4: Wharehuanui Resource Study Area – Indigenous Vegetation and Habitat**

*Note: Figure 4 is a schematic spatial representation of indigenous ecological values only – the plan is not a detailed plan of the extent of the identified sites.*

**Bold red line shows the extent of the Wharehuanui Resource Study Area**



### Rock Outcrops and Dry North Facing Slopes

Rock outcrops situated on the ridge plateau and north facing slopes of the study area have provided some protection from historical disturbance with indigenous shrubs, short tussock and cushion plants persisting on some of these sites. Plate 1 presents photographs of existing indigenous species and communities on these dry sites that generally have thin skeletal soils.



**Plate 1:** Indigenous flora and vegetation values on rock outcrops and north facing slopes

Indigenous plant species that have been recorded on the rocky outcrops and north facing slopes are provided in Table 1.

**Table 1:** Indigenous Plant Species and Associated Threat Status (de Lange *et al.*, 2013).

Common Name	Scientific name	Threat Classification
Bracken Fern	<i>Pteridium esculentum</i>	Not threatened
Blue wheatgrass	<i>Elymus solandri</i>	Not threatened
Blue tussock	<i>Poa colensoi</i>	Not threatened
<i>Raoulia apicinigra</i> (cushion plant)	<i>Raoulia apicinigra</i>	Not threatened
<i>R. australis</i> (cushion plant)	<i>R. australis</i>	Not threatened
Scented tree daisy	<i>Olearia odorata</i>	Not threatened
Porcupine shrub	<i>Melicytus alpinus</i>	Not threatened
Small-leaved pohuehue (climber)	<i>Muehlenbeckia complexa</i>	Not threatened
Bush lawyer (climber)	<i>Rubus</i> species	Not threatened
Red woodrush	<i>Luzula rufa</i> var. <i>rufa</i>	Not threatened
Matagouri	<i>Discaria toumatou</i>	Not threatened
Dwarf mingimingi	<i>Leucopogon fraseri</i>	Not threatened

#### Wetlands and Riparian Vegetation

Historically a range of wetlands would have been present in the study area, mainly associated with poor drainage sites and landscape depressions on the ridge plateau and the flood plain of Mill Creek. Plate 2 shows an example of a wetland to the west of Hunter Road that has open water habitat fringed by pedestal tussock (*Carex secta*). Whilst viewing this wetland from the road DCG recorded a range of wildlife present in and around the wetland including Canada geese, pukeko, mallard ducks and black swans.



**Plate 2:** Hunter Road Wetland.



There are a number of wetlands located within landscape depressions on the ridge plateau (see Plate 3). These wetlands are dominated by the introduced soft rush (*Juncus effusus*), however sedgeland is also present that contains the indigenous sedge *Carex gaugichaudiana* within a sward of introduced grasses.



**Plate 3:** Sedgeland on ridge plateau to the west of Dalglish Farm

Wetlands and riparian margins associated with the flood plain of Mill Creek (see Plate 4) are largely dominated by introduced species including the soft rush (*Juncus effusus*) and introduced grasses browntop (*Agrostis capillaris*), cocksfoot (*Dactylus glomerata*) and sweet vernal (*Anthoxanthum odoratum*). In addition willow trees are also a significant element of the vegetation adjacent to Mill Creek.



**Plate 4:** Wetland and riparian vegetation adjacent to Mill Creek on Dalglish Farm

Figure 5 presents a plan showing the layout of the Dalglish Farm and also provides representative photographs of the areas of the farm that have been identified to have some ecological value.

### 2.2.2 Fauna

The vegetation communities that remain within the study area and the wider Wakatipu Basin are all small in scale, highly degraded from their original condition and isolated. The loss and degradation of habitat has resulted in a significant loss of both flora and fauna diversity. Notwithstanding this point, remnants do persist that provide habitat for indigenous wildlife.

#### *Skinks and Geckos*

The vegetation and rocky outcrops provide habitats that may support the Otago large gecko (*Woodworthia* 'Otago large'), the cryptic skink (*Oligosoma inconspicuum*), McCann's skink (*O. maccanni*) and the common skink (*O. polychroma*) (Whitaker *et al.*, 2002), of which the Otago large gecko and cryptic skink are both listed as 'At Risk – Declining' (Hitchmough *et al.*, 2013).

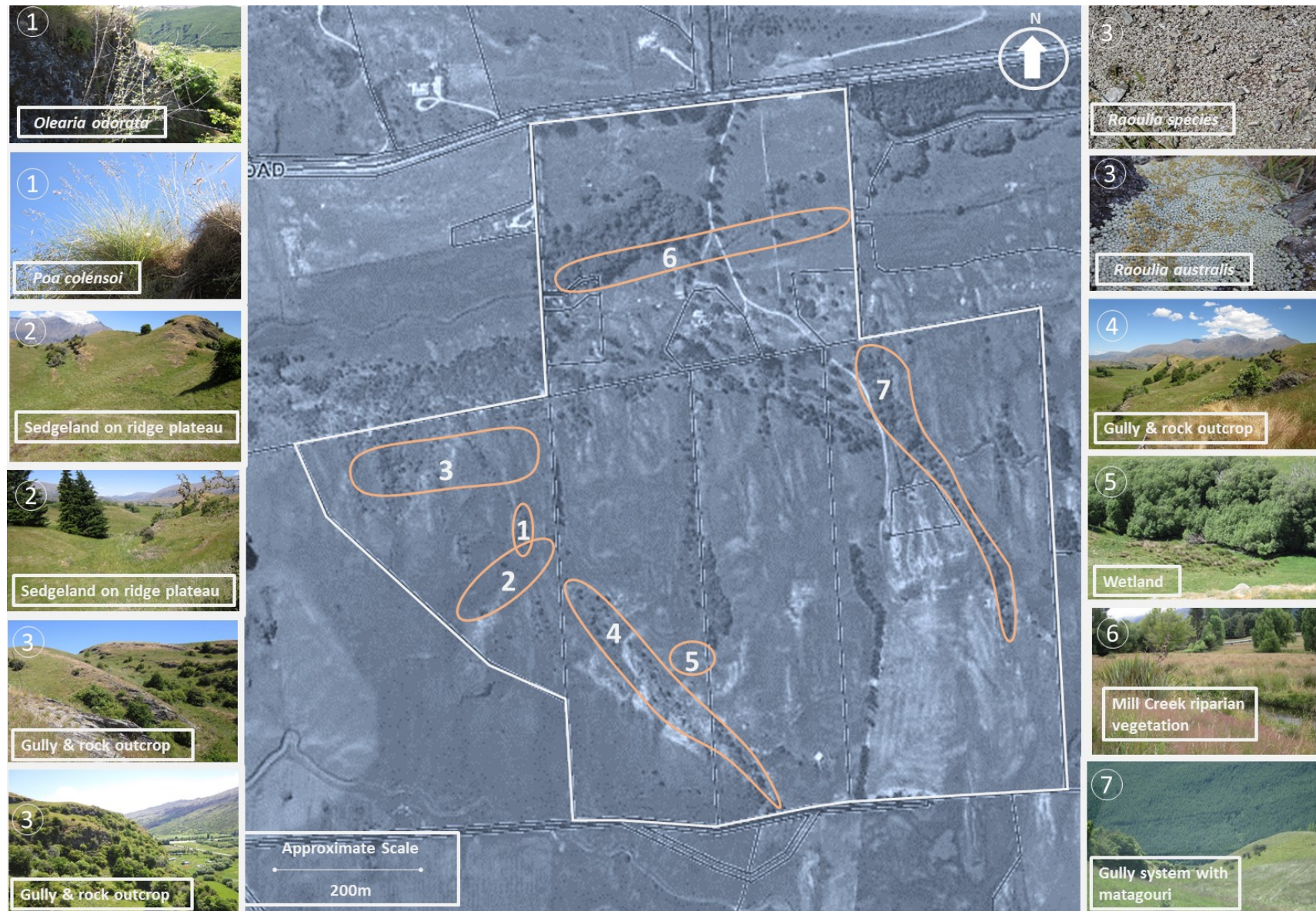
#### *Invertebrates*

New Zealand invertebrate species have a high level of endemism, in particular within the Wakatipu Basin (Lucas Associates, 1995). The isolated areas of native vegetation may provide habitat for native invertebrates and allow their use of the surrounding exotic grassland (Derraik *et al.*, 2005). Increased areas of indigenous vegetation on site would be beneficial to native invertebrate populations (Derraik *et al.*, 2005).

#### *Avifauna*

There are at least 18 native bird species present within the Wakatipu Basin that may already visit the site (Robertson *et al.*, 2013; eBird, 2015). These bird species and their threat status are provided in Table 2 below. Four of the 18 species are classified as 'At Risk': the eastern falcon, NZ pied oystercatcher, the black shag and the pied stilt.





**Figure 5:** Ecological Values of Dalglish Farm



**Table 2: Indigenous Bird Species and Associated Threat Status (Robertson *et al.*, 2013).**

Common Name	Scientific Name	Threat Classification	Associated Habitat
Eastern falcon	<i>Falco novaeseelandiae</i> 'eastern'	At Risk - Recovering	Forest, tussock grassland & shrubland.
NZ pied oystercatcher	<i>Haematopus finschi</i>	At Risk – Declining	Riverbeds, farmland & grassland.
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Naturally Uncommon	Streams, lakes, ponds.
Pied stilt	<i>Himantopus himantopus leucocephalus</i>	At Risk - Declining	Wetlands.
Fantail	<i>Rhipidura fuliginosa fuliginosa</i>	Not Threatened	Forest & shrubland.
NZ bellbird	<i>Anthornis melanura melanura</i>	Not Threatened	Forest & shrubland.
Harrier hawk	<i>Circus approximans</i>	Not Threatened	Farmland & wetlands.
Welcome swallow	<i>Hirundo neoxena neoxena</i>	Not Threatened	Wetlands
Grey warbler	<i>Gerygone igata</i>	Not Threatened	Shrubland & forest.
Paradise shell duck	<i>Tadorna variegata</i>	Not Threatened	Farmland, grassland, ponds.
Tui	<i>Prothemadera novaeseelandiae novaeseelandiae</i>	Not Threatened	Forest & shrubland.
Southern black-backed gull	<i>Larus dominicanus dominicanus</i>	Not Threatened	Farmland & tussock grassland.
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened	Wetlands, farmland & grassland.
NZ woodpigeon	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Forest & shelterbelts.
Sacred Kingfisher	<i>Todiramphus sanctus vagans</i>	Not Threatened	Farmland & lakes.
Pukeko	<i>Porphyrio melanotus melanotus</i>	Not Threatened	Wetlands, farmland, grassland & scrub.
Shining cuckoo	<i>Chrysococcyx lucidus lucidus</i>	Not Threatened	Forest & shrubland.
Silvereye	<i>Zosterops lateralis lateralis</i>	Not Threatened	Widespread.

## 2.3 Ecological Values Summary

The existing ecological values on Dalglish Farm are associated with the rocky outcrops and dry north facing slopes located to the west of the property. All vegetation is highly degraded, isolated and generally small in scale and threatened species are highly unlikely to be present on the site. Notwithstanding the nature of the ecological values, the development footprint of the golf course and proposed residential housing is removed from the remnant vegetation and it is highly unlikely the development would disturb the ecological values that persist today. Furthermore, MCC proposes to support ecological values and undertake restoration and revegetation activities to promote the values of the site and also support restoration activities that are occurring throughout the basin.

### 3.0 ECOLOGICAL RESTORATION OPPORTUNITIES

#### 3.1 Overview

As discussed, the long history of pastoral activity on Dalgleish Farm and the wider study area has resulted in the almost total conversion of the landscape to an ecology dominated by exotic pasture grasses, hedgerows and woody weeds. Indigenous terrestrial ecology values can now only be found within wetlands and on sites that have been protected by rock outcrops. Consequently, DCG considers the proposed development of Dalgleish Farm is highly unlikely to result in negative effects on the indigenous ecology of the property. There are, however, some existing values that can be supported and included into the development of the site that can provide significant ecological benefits to Dalgleish Farm and the Wakatipu Basin.

In 1997 The Wakatipu Environment Society engaged ecologist Colin Meurk to examine the natural heritage of the Wakatipu Basin and provide advice on restoration opportunities. The outcome of this investigation "*Rediscovering & Restoring Natural Heritage in the Wakatipu Basin*" has been one of the cornerstone pieces of work that has provided a philosophy and guidance for restoration activities across the basin. Meurk (1997) suggests that recovery of indigenous vegetation would include enhancement of waterway function, protection of remnant natural habitat, re-establishing larger more viable populations of indigenous plants and wildlife, and thus establishing improved visual and biological linkages in which sustainable heritage elements are integrated within the productive activities of the basin.

The path towards the vision set out by Colin Meurk is in progress and is clearly shown in the following:

- Establishment of Project Gold by the Department of Conservation with the objective to encourage Otago people to grow and look after their own kōwhai trees and strengthen enthusiasm for dryland forest restoration.
- Acceptance by council that ecological restoration can be a positive benefit under the Resource Management Act, with these benefits often integral in the granting of subdivision consents such as the Walter Peak, Threepwood, Littles Stream, Jacks Point, Hawthorn and Highground subdivisions.
- Establishment of the Wakatipu Reforestation Trust that has attracted significant funding to construct a native plant community nursery for the Wakatipu.
- The Wakatipu Restoration Trust is also involved in maintenance of existing sites and identification of further sites for restoration.

### 3.2 Restoration Opportunities

Using the principles set out in Meurk (1997), DCG has identified a number of ecological restoration opportunities for the development of the Dalgleish Farm. The opportunities include:

- Supporting existing ecological values including indigenous plants, invertebrates, lizards and birds in the vicinity of rock outcrops and wetlands;
- Assist successional processes that are currently in their infancy to ensure a successional trajectory dominated by indigenous species rather than woody weeds;
- Riparian planting and control of willows along Mill Creek;
- Planting into sites that provide the conditions for good growth rates and easier establishment, such as the bottom of gullies and wetlands; and
- Promoting native plantings within gardens associated with residential development.

Working with landscape architects Baxter Design Group, DCG has prepared an ecological restoration concept plan for Dalgleish Farm to incorporate the opportunities detailed above. Figure 6 presents this concept with detail associated with these opportunities provided below.

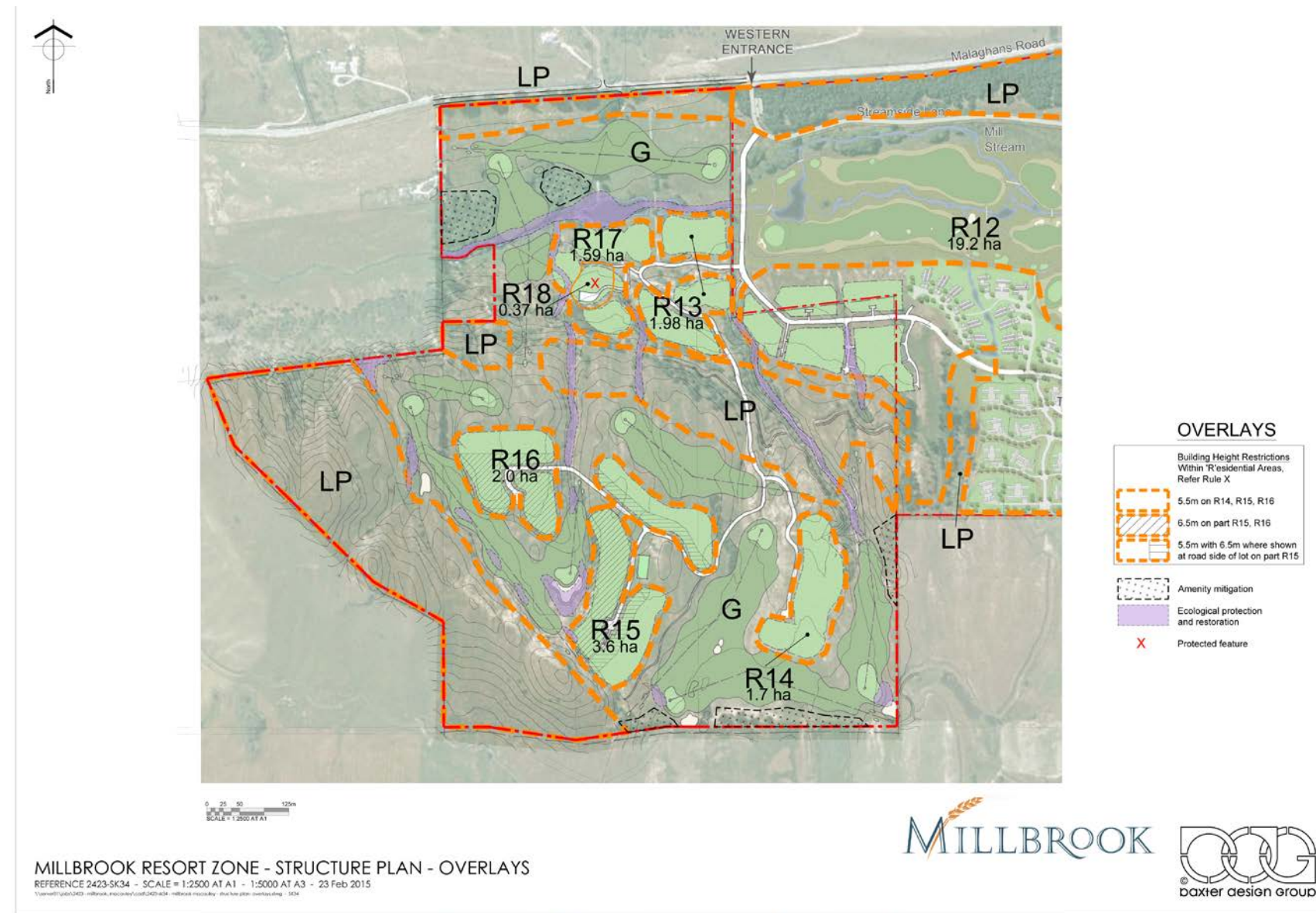
#### 3.2.1 Support for Existing Ecological Values

Areas of existing terrestrial ecological values are predominantly found around the rocky outcrops to the west of Dalgleish Farm. DCG recommends the pocket planting of shrubland species to provide a food source for invertebrates, lizards and birds in these areas. The rock outcrops are lacking some key species known to support lizard species such as coprosmas and porcupine shrub (*Melicactus alpinus*) and these species along with kowhai and tree daisies should be utilised to support these existing values. An example of similar planting at a Project Gold site on Whitechapel Road is provided in Plate 5.



**Plate 5:** Project Gold shrubland restoration, Whitechapel Road





**Figure 6:** Dalglish Farm Ecological Restoration Concept Plan

### 3.2.2 Support for Successional Processes

Bracken fern has established strongly on the dry steep north facing slopes of the Dalgleish Farm. In the Lakes Ecological Region, bracken fern is the dominant early successional species that provides the environment for later successional shrubland species to regenerate within. Currently the surrounding area has a lack of indigenous species with the ability to disperse seed into the bracken fern and thus woody weed species such as hawthorn and briar are likely to establish within the bracken fern over time.

In order to support the natural successional process DCG recommends the pocket planting of kowhai, coprosmas, tree daisies and matagouri in favourable locations adjacent to the bracken fern so that a seed source is provided that can ultimately seed into the bracken fern. Woody weed control will also be required if briar, hawthorn, and broom invade these sites.

### 3.3.3 Restoration of Wetlands and Mill Creek Riparian Planting

Four wetlands on the ridge plateau of Dalgleish Farm have been located on the site that are currently dominated by exotic rushes and pasture grass species. Restoration of these sites by planting into the wetlands with indigenous species such as *Carex*, *Juncus*, toetoe and flax and supported with shrubland species tolerant of periodic saturation such as *Coprosma propinqua* and kowhai, will significantly improve the function and habitat quality of these wetlands.

MCC has completed some quality riparian planting adjacent to Mill Creek as shown in Plate 6. A continuation of this planting along the length of Mill Creek in addition to the control of willow trees will enhance the habitat values of Mill Creek.



**Plate 6:** Established Riparian Planting of Mill Creek completed by MCC.



### 3.3.5 Planting into new areas

A total of four gullies that bisect the ridge plateau and drain towards Mill Creek have been identified as excellent sites for planting of shrubland species. Historically DCG understands these gullies would have supported shrubland communities but are now dominated by pasture grasses and woody weeds (particularly hawthorn). The gullies do contain some isolated mature matagouri shrubs and DCG considers these areas are ideal for re-establishing shrubland that can make an important contribution to the natural heritage of the site. Plate 7 shows a tree daisy dominated shrubland in the Bush Creek catchment (see Figure 4). DCG considers the natural regeneration of a tree daisy and coprosma dominated shrubland that is ongoing within the Bush Creek catchment can be used as a guide for restoration work within the gullies.

The planting of a range of tree daisy species, coprosmas and kowhai into these gullies will provide habitat for invertebrates and a food supply for native birds. Furthermore, it will also be possible to connect the gully plantings with Mill Creek that will support the movement of invertebrates and birds through the site.



**Plate 7:** Tree Daisy (*Olearia odorata*) dominated shrubland in Bush Creek

### 3.3.5 Residential Development

DCG understands approximately 50 house sites are proposed as part of the golf course and residential development of Dalglish Farm. Landscaping of the house sites and possibly some of the golf course will result in the planting of significant quantities of plants for amenity and screening value. Baxter Design Group has recommended that the species predominantly utilised for planting on the golf course and on the house sites will be indigenous species that are

consistent with the original vegetation of the Wakatipu Basin. Adopting this initiative for the plan change will provide additional habitat for invertebrates and a food supply for birds and further enhance the natural heritage values of Dalgleish Farm.

### 3.3.6 Pest Control

#### *Willow Control*

The low lying area of Dalgleish Farm where Mill Creek enters the property is dominated by mature willow trees. In this area the willow trees have heavily infested the riparian margin of Mill Creek and also extend into the adjacent low lying areas. MCC proposes to undertake significant willow control to remove the willows from the riparian margin and to open the canopy in the adjacent areas to allow light into the area. This will support the restoration activities along the riparian margin of Mill Creek.

Willow trees are also present in some of the gullies that bisect the ridge plateau. Willow control will also be implemented in these areas to support restoration planting works.

#### *Wilding Pine Control*

Landscape Protection Areas (LPAs) have been identified on the Dalgleish Farm that MCC propose to manage by grazing stock. The LPAs are areas where wilding pine trees can establish on the property. In order to minimise the risk of wilding pine establishment, MCC will monitor the LPAs and ensure all seedlings that establish are removed from the property.

#### *Woody Weed Control*

Woody weeds that are currently present on Dalgliesh Farm include broom, gorse, hawthorn, briar, rowan and elderberry. MCC will implement a broom and gorse control program and will also remove other woody weeds to support restoration planting activities.

#### *Rabbit Control*

The Otago Regional Council has been approached for comment on MCCs proposal for Dalgliesh Farm. The ORC have noted that the Central Otago and Lakes Districts are areas of concern due to the level of development in these areas affecting the available methods for effective rabbit control. In order to address this concern MCC proposes to rabbit proof fence the boundaries of Dalgliesh Farm and undertake rabbit control across the site to ensure populations on Millbrook are controlled effectively and are consistent with the requirements of the ORC Pest Management Strategy for Otago. Current control measures used by Millbrook Resort, which will be extended to the Dalgleish Farm, include:

- Rabbit shooting away from residential areas;
- Engagement of a rabbit control contractor; and



- Pindone drops, away from residential areas.

### 3.3.7 Summary and Recommendations

In summary, the restoration opportunities discussed herein can provide a major contribution to the ecology of Dalglish Farm and the Wakatipu Basin. Together with restoration projects associated with other subdivisions, Project Gold sites and a growing awareness of the basins natural heritage, the building blocks to support the vision of local conservationists to restore and enhance indigenous biodiversity are slowly establishing.

In order for the restoration opportunities described herein to be implemented DCG recommends provisions in the plan are included to provide for the preparation of an Ecological Management Plan. The EMP would provide specific detail on the implementation of the restoration concept plan described above.

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