

Prepared for Irricon Ltd on behalf of Mt Gerald Station Ltd  
by Ryder Consulting Ltd

## **Mt Gerald**

### Vegetation Assessment of Proposed Irrigation Development



**ryderconsulting**  
environment + planning + project management

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Ltd by Ryder Consulting Ltd

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### Vegetation Assessment of Proposed Irrigation Development

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# 1. Introduction

Mt Gerald Station has applied to the Mackenzie District Council (MDC) for a Certificate of Compliance (RM150057) for the proposed installation of ten centre pivot irrigators near Lilybank Road, Lake Tekapo. It is proposed that irrigators would be located at two sites (Figure 1.1): three pivots adjacent to the Macaulay River ('The Macaulay Block'; Figure 1.2), and seven pivots to the east of Lake Tekapo and south of Coal River ('The South End Block'; Figure 1.3). MDC has requested additional information<sup>1</sup> about the proposal. Ryder Consulting was engaged to address item 5 of the MDC request, which asks:

- *What vegetation types are to be irrigated and how will the proposal comply with the vegetation clearance rules in Section 7 of the [District] Plan?*

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<sup>1</sup> Letter from Craig Welsh for Nathan Hole, MDC, to Nicola Scott, Hughes and Associates Ltd, dated 6 November 2015.

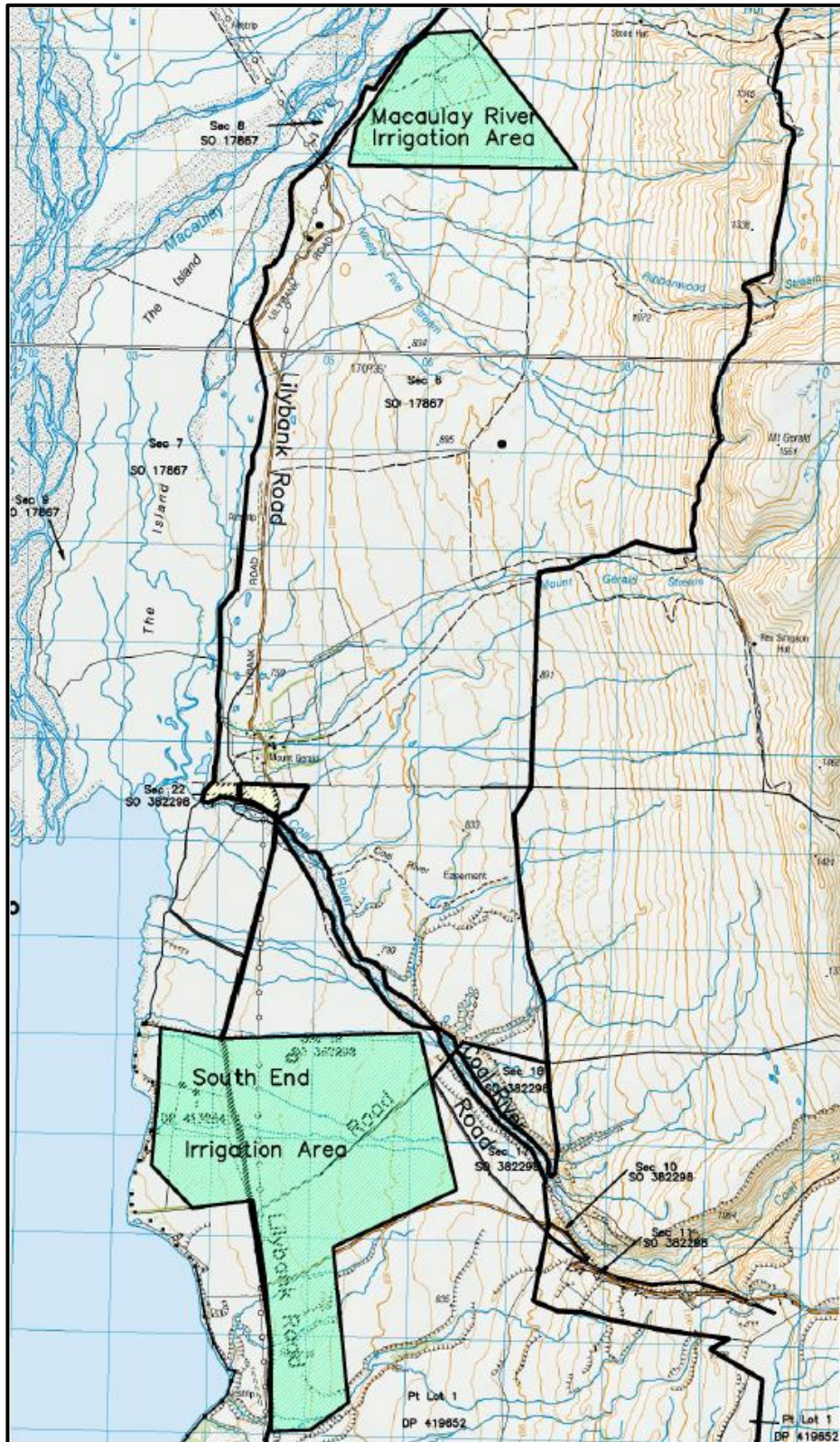
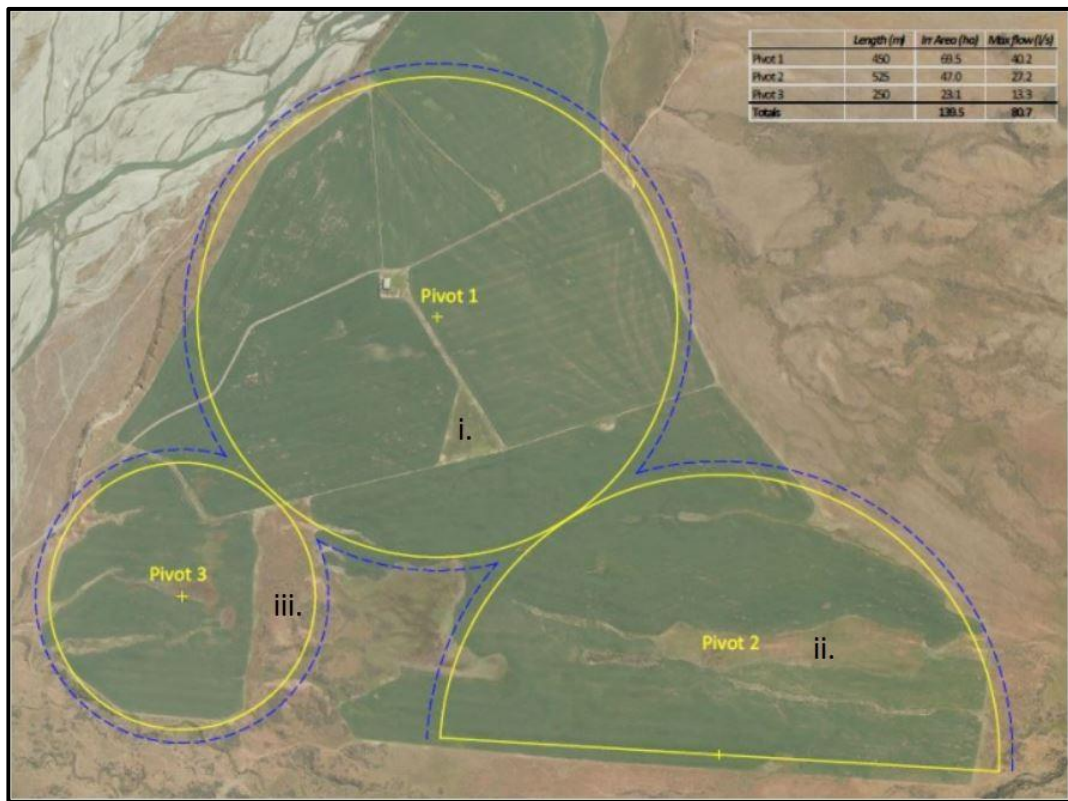
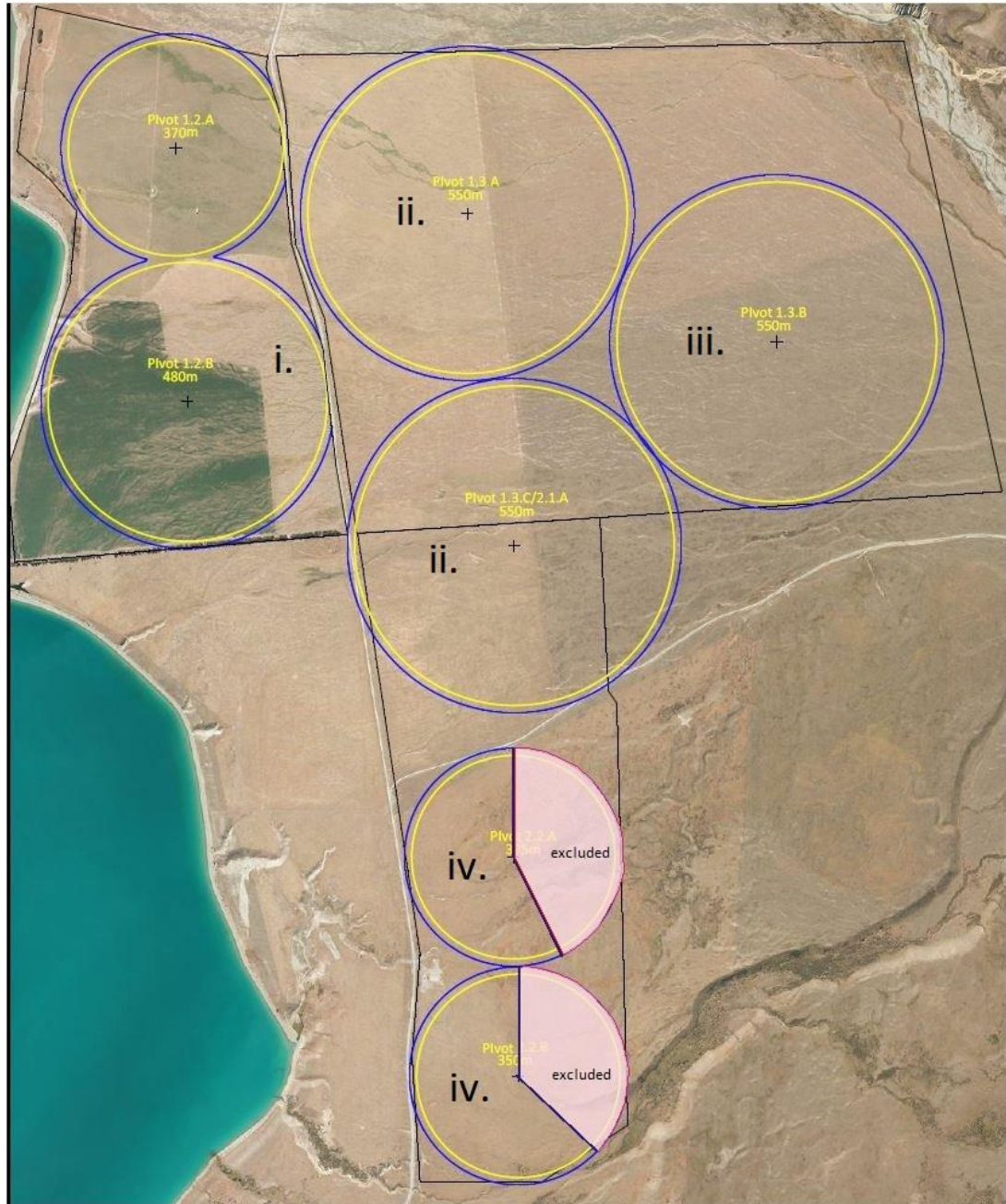


Figure 1.1. Locations of proposed irrigation development.



**Figure 1.2.** Locations of proposed centre pivots irrigators at the Macaulay Block. Vegetation at locations i., ii., and iii. is described in more detail in the text. The aerial photograph is sourced from the Canterbury 2013-2014 rural aerial photograph collection.



**Figure 1.3. Location of proposed centre pivot irrigators at the South End Block. The shaded sections of pivots 2.2A and 2.2B marked as 'excluded' would not be irrigated. That is, pivots 2.2A and 2.2B would be 'wipers; which would travel back and forward, and would not pass over the excluded sections. The aerial photograph is sourced from the Canterbury 2013-2014 rural aerial photograph collection.**

## 2. Methods

Vegetation at the proposed irrigation sites was surveyed on 18 November 2015. Prior to and after the surveys, recent aerial photographs (the Canterbury 2013-2014 0.3 m rural aerial photograph collection) were examined closely using GIS software, to supplement field observations.

The proposed pivot sites were first inspected and photographed at low elevation by helicopter, to identify the major vegetation types. Sites with areas of indigenous vegetation, such as fescue ('hard') tussock<sup>2</sup> and indigenous shrubs, were identified from the air. These sites were then visited on the ground to conduct more detailed surveys to assess vegetation in terms of the various standards under Rule 12.1 in the District Plan.

At locations with fescue tussock, the percentage of fescue tussock canopy cover was estimated from aerial inspection from the helicopter, photographs taken from the helicopter survey, and on the ground observations. Grids laid over photographs and standard percentage cover reference charts were used to assist in estimating cover. At locations where fescue tussock cover might approach the 15% canopy cover criterion in standard 12.1.1.g. in the District Plan, the percentage of vegetative cover comprising inter-tussock exotic grasses and clovers was estimated to allow an assessment against the exemption criterion under 12.1.1.g. This exemption states:

*Any short tussock grassland where the site has been oversown, and topdressed at least three times in the last 10 years prior to new clearance so that the inter-tussock vegetation is dominated by clovers and/or exotic grasses.*

Cover estimates were made within five 0.5-m<sup>2</sup> plots that were placed haphazardly (without looking at ground cover) along transects within areas of tussock.

At sites where shrubs were present, shrub species, area, percentage cover, and average and maximum shrub height were recorded to allow an assessment against standard 12.1.1.f., which consider shrublands.

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<sup>2</sup> Common names of plants are used throughout this report, except for species with no common name, where the scientific name is used. Scientific names are listed in Appendix A.



## 3. Results and discussion

### 3.1 Macaulay Block

The vegetation at the proposed locations of pivots 1, 2 and 3 at the Macaulay Block consists almost entirely of recently-sown wheat crop (pivots 1 and 3; Photo 1, Appendix B) and pasture grasses (pivot 2; Photo 2). Exceptions to these vegetation types occur at three small parts of the site, marked on Figure 1 as (i), (ii), and (iii). The vegetation at location (i) in Figure 1.2. is a different colour on the aerial photograph because it consists of a mixture of rougher grass and various exotic herbs including red and white clover, plantain species, sheep sorrel, dock, thistles, and yarrow, rather than the new, 'clean' pasture in the surrounding paddocks.

At location (ii), matagouri is present as scattered individuals and some small patches amongst improved pasture (Photo 3). A few sparsely-distributed individual sweet briar and fescue tussocks are also present at this location.

The vegetation at location (iii) consists of scattered matagouri and sweet briar amongst improved pasture (Photo 4) and a typical mixture of exotic herbs (as above). Fescue tussock and creeping pohuehue are present as isolated individuals (<1% cover) amongst the pasture at this location.

Table 3.1 contains an assessment of the vegetation at the Macaulay Block against Standards 12.1.1a –12.1.1.h of Rule 12.1 of the District Plan. This assessment shows that vegetation clearance at the Macaulay Block site would comply with all of the standards under Rule 12.1.

**Table 3.1. Assessment of vegetation at the Macaulay Block against the standards set out under Rule 12.1 (Vegetation Clearance) in the District Plan.**

Standard	Assessment
12.1.1.a. Riparian Areas	Complies. No vegetation clearance is proposed within the prescribed distances of rivers or lakes at the Macaulay site. The north-western fence line of the paddocks under the proposed pivot 1 is, at its closest point, 32 m from the edge of Macaulay river bed, which is greater than the 20-metre criterion specified in this standard.
12.1.1.b. Sites of Natural Significance	Complies. The Macaulay Block site is not located within a Site of Natural Significance.
12.1.1.c. Tall Tussock and Canopy	Complies. No tall tussock is present.
12.1.1.d. Wetlands	Complies. No wetlands are present (patches of wet pasture at this site are not wetlands as defined by the District Plan).
12.1.1.e. High Altitude Areas	Complies. The site is entirely below 900 metres elevation (the highest part of pivot 2 is at 860 m).
12.1.1.f. Shrublands	Complies. The sites contains no shrublands with the indicator species listed under the first bullet point in the standard, nor does it contain dense shrubland defined in the second bullet point of standard.  With reference to the third bullet point of the standard, the matagouri at locations ii. and iii. (see text and figures) is sufficiently dense in a few places to comprise shrubland <sup>3</sup> but has an average canopy height of much less than the 1.5-metre criterion in the standard (maximum height was 0.7 m at sites visited).
12.1.1.g. Short Tussock Grasslands	Complies. No short tussock grassland is present.
12.1.1.h. Indigenous Cushion and Mat Vegetation	Complies. No indigenous cushion and mat vegetation is present.

### 3.2 South End Block

The proposed pivot sites at the South End block fall into three groups, each with broadly similar vegetation (Figure 1.3): 1) pivots 1.2A and B, west of Lilybank Road,

<sup>3</sup> 20-80% cover > cover than any other growth form (Atkinson 1981).

2) pivots 1.3A, B and C, east of Lilybank Road and north of the Round Hill ski field road, and 3) pivots 2.2A and B, east of Lilybank Road and south of the ski field road. These three groups of pivots are assessed separately, below.

### **Proposed pivots 1.2A and 1.2B**

Pivot 1.2A is currently planted entirely in Lucerne (Photo 5). Pivot 1.2B is also planted entirely in crops, with ryecorn, wheat and Italian ryegrass in different areas (Photo 5, background). These crops were at various growth stages at the time of this survey, ranging from recently sown and just beginning to emerge, to well-established and about knee-height.

Although entirely planted in various crops, part of the eastern side of pivot 1.2B includes some fescue tussock. The area labelled i. in Figure 1.3, which is approximately 16 ha in area, comprises a mixture of fescue tussock and exotic pasture (Photo 6). New grass was emerging at the time this survey was carried out. Estimated average canopy cover of fescue tussock in this area was 10% (range 0% - 20% in patches), which is below the 15% short tussock threshold stated in standard 12.1.1.g. However, because tussock density was highly patchy within this area, as can be seen in Photo 6, an assessment was also made of the denser patches of fescue tussock, where tussock comprised up to 20% of canopy cover. Within these denser patches of fescue tussock, cover of inter-tussock exotic grasses and clovers ranged from 15% to 95% (mean 60%) at the time of sampling (e.g. Photo 7). Because this site had recently been direct-drilled, and new grass was beginning to emerge, exotic grass will become more dominant. The site complies with standard 12.1.1.g because the average short tussock cover comprises less than 15% of canopy cover, and/or inter-tussock vegetation is dominated by exotic grasses and clovers. As detailed in Table 3.2, this site also complies with all other standards under Rule 12.1.

**Table 3.2. Assessment of proposed pivots 1.2A and 1.2B in the South end block against the standards set out under Rule 12.1 Permitted Activities – Vegetation Clearance in the District Plan.**

Standard	Assessment
12.1.1.a. Riparian Areas	Complies. No indigenous vegetation will be cleared.
12.1.1.b. Sites of Natural Significance	Complies. Not within a Site of Natural Significance.
12.1.1.c. Tall Tussock and Canopy	Complies. No tall tussock is present.
12.1.1.d. Wetlands	Complies. No wetlands are present (patches of wet pasture at this site are not wetlands as defined by the District Plan).
12.1.1.e. High Altitude Areas	Complies. The site is entirely below 900 metres elevation.
12.1.1.f. Shrublands	Complies. The sites contains no shrublands.
12.1.1.g. Short Tussock Grasslands	Complies. Average short tussock cover is <15%. In denser patches of short tussock, exotic grasses and clovers dominate. See text for further detail.
12.1.1.h. Indigenous Cushion and Mat Vegetation	Complies. No indigenous cushion and mat vegetation is present.

### **Proposed pivots 1.3A, B and C**

The existing vegetation within the locations of proposed pivots 1.3A, B, and C has been sprayed off and re-sown in ryecorn, and the second round of ryecorn growth after first grazing was just beginning to emerge at the time of this survey. Much of the ground cover consisted of dead vegetation or bare ground when surveyed, although this will change rapidly as the crop develops again. The following assessment considers previous vegetation as well as the existing and developing vegetation.

Vegetation cover differs somewhat on either side of a fenceline that runs north south through this area, as shown by the black line in Figure 1.3. An aerial oblique view of the vegetation on either side of the fenceline is shown in Photo 8. To the west of the fenceline (to the left in Photo 8), labelled as location (ii) in Figure 1.3, bare ground and dead leaf litter comprise a large (>50%) proportion of ground cover. Live vegetation comprises mainly the newly-emerging second graze ryecorn with some surviving exotic pasture grasses and herbs, including sweet vernal, browntop, mouse-ear hawkweed ('hieracium'), and clovers (e.g. Photo 9). In some

places scattered individuals or sparse patches of apparently-dead fescue tussock are present, but make up less than 1% of total ground cover. No indigenous shrubs are present.

To the east of the fenceline, labelled as location (iii) in Figure 1.3, the vegetation is (was) more diverse and fescue tussock (dead) is present as scattered individuals and patches. Fescue tussock makes up an average of 8% of total ground cover over this area. As well as the species noted to the west of the fenceline, the following indigenous species were recorded: *Leucopogon fraseri*, *Acrothamnus colensoi*, *Pimelea oreophila*, *Brachyglottis bellidioides*, *Celmisia gracilentia*, *Carmichaelia vexillata*, porcupine shrub and matagouri. The latter two shrubs occur as patches, merging into open shrubland toward the ski field road.

Table **3.3** contains an assessment of the vegetation at the proposed pivots 1.3A, B and C under Rule 12.1 of the District Plan. This assessment shows that vegetation clearance at this site would comply with all of the standards under Rule 12.1.

**Table 3.3. Assessment of proposed pivots 1.3A, B and C in the South end block against the standards set out under Rule 12.1 Permitted Activities – Vegetation Clearance in the District Plan.**

Standard	Assessment
12.1.1.a. Riparian Areas	Complies. Not within a riparian zone.
12.1.1.b. Sites of Natural Significance	Complies. Not within a Site of Natural Significance.
12.1.1.c. Tall Tussock and Canopy	Complies. No tall tussock is present.
12.1.1.d. Wetlands	Complies. No wetlands are present.
12.1.1.e. High Altitude Areas	Complies. The site is entirely below 900 metres elevation.
12.1.1.f. Shrublands	<p>Complies. The site does not contain bog pine shrublands, dense indigenous shrublands or matagouri-dominated shrublands. With regard to open shrubland, subclause (ii) in this standard states there shall be no clearance of:</p> <p><i>More than 2000 square metres of open indigenous shrublands containing at least three of the following indicator species where these shrubs are prominent: native broom (Carmichaelia species) or; tauhinu (Cassinia species) or; porcupine shrub (Melicytus species) or; Coprosma intertexta or; prostrate kowhai (Sophora prostrata);</i></p> <p>Patches of open indigenous shrubland are present toward the south-eastern corner of proposed pivot 1.3C. One of the indicator species listed above, porcupine shrub, is prominent in places. Another indicators species (<i>Carmichaelia vexillata</i>) is present but not prominent. These areas of open shrubland therefore comply with the standard.</p>
12.1.1.g. Short Tussock Grasslands	Complies. Average short tussock cover is <15%.
12.1.1.h. Indigenous Cushion and Mat Vegetation	Complies. Indigenous cushion and mat species are present but well below the 50% cover or 20 species threshold in this standard.

### **Proposed pivots 2.2A and 2.2B**

The proposed pivots 2.2A and 2.2B are 'wipers'. That is, it is proposed that rather than moving through a full circle, each irrigator will move back and forward to irrigate part of its potential full circle, as shown in Figure 1.3. At the time of sampling, vegetation under the area proposed to be irrigated by pivots 2.2A and 2.2B had been sprayed off and sown in Italian ryegrass (Photo 10). Ground cover therefore consisted of >95% bare ground and dead leaf litter. Live vegetation made up <5% of ground cover and consisted of newly-emerging Italian ryegrass, mouse ear hawkweed ('hieracium'), and very sparse white clover and broadleaf pasture weeds. Once the Italian ryegrass becomes established it will dominate the vegetative cover.

To provide an assessment of vegetation composition and cover prior to the recent spraying and direct drilling, existing (dead) fescue tussock cover was estimated across the proposed irrigation sites, and inter-tussock vegetation was assessed in the adjacent non-sprayed areas, as follows. Fescue tussock cover was highly variable, ranging from nil in many areas through to 27% in the densest patches. Average (dead) fescue tussock cover made up an estimated 15% of total ground cover. Inter-tussock vegetation in non-sprayed areas is dominated by exotic pasture grasses (sweet vernal, browntop), with some white clover (Photos 11 & 12).

Table 3.4 contains an assessment of the vegetation at the proposed pivots 2.2A and 2.2B under Rule 12.1 of the District Plan. This assessment shows that vegetation clearance at this site would comply with all of the standards under Rule 12.1.

**Table 3.4. Assessment of proposed pivots 2.2A and 2.2B in the South end block against the standards set out under Rule 12.1 Permitted Activities – Vegetation Clearance in the District Plan.**

Standard	Assessment
12.1.1.a. Riparian Areas	Complies. Old river channels are visible (as they are across the entire landscape) and the topographic map shows three of these as watercourses. However, from inspection on the ground and of aerial photos, it is apparent that these are not active channels.
12.1.1.b. Sites of Natural Significance	Complies. Not within a Site of Natural Significance.
12.1.1.c. Tall Tussock and Canopy	Complies. No tall tussock is present.
12.1.1.d. Wetlands	Complies. No wetlands are present within the proposed irrigation areas.
12.1.1.e. High Altitude Areas	Complies. The site is entirely below 900 metres elevation.
12.1.1.f. Shrublands	Complies. The site does not contain shrublands. Patchy matagouri shrubland is present on the slopes above the proposed pivots, but these are not within the proposed irrigation area.
12.1.1.g. Short Tussock Grasslands	Complies. Following recent spraying and re-sowing, little to no fescue tussock remains, and vegetation will soon be dominated by Italian ryegrass. Prior to spraying, it is estimated that average short tussock cover was 15%, with inter-tussock vegetation dominated by exotic grasses and clovers. The landholder has advised that the site had been oversown and top-dressed at least three times within the last 10 years. Thus, prior to spraying, the site also complied with this standard.
12.1.1.h. Indigenous Cushion and Mat Vegetation	Complies. Indigenous cushion and mat species were not recorded at this site.



## 4. Summary

The vegetation at the three proposed pivot sites at the Macaulay Block consists almost entirely of recently-sown wheat crop and pasture grasses. Scattered indigenous species including fescue tussock and matagouri are also present but at densities that comply with all of the standards under vegetation clearance Rule 12.1 in the District Plan.

At the South End block, vegetation within proposed pivots 1.2A and 1.2B, which are within the lakeside protection zone consists almost entirely of intensively-farmed lucerne, ryecorn, wheat and Italian ryegrass. A 16-ha area includes fescue tussock with average cover of 10% and inter-tussock species dominated by exotic grasses and clovers. This site complies with all of the standards under Rule 12.1.

Vegetation within the locations of proposed pivots 1.3A, B, and C comprises mainly ryecorn in the western parts of the site. To the east, the vegetation is more diverse, and includes, as well as recently sown ryecorn, a number of indigenous species. Patches of open indigenous shrubland are present toward the south-eastern corner of proposed pivot 1.3C. The indigenous vegetation that is at these proposed pivots complies with all of the standards under Rule 12.1.

Vegetation at the proposed pivots 2.2A and 2.2B has recently been sprayed off and sown in Italian ryegrass. Ground cover therefore consisted of >95% bare ground and dead leaf litter at the time of sampling. Prior to spraying, fescue tussock cover made up an estimated 15% of total ground cover, with inter-tussock vegetation dominated by exotic pasture grasses and some white clover. The landholder has advised that the site had been oversown and top-dressed at least three times within the last 10 years. Thus, prior to spraying, the site also complied with all of the standards under Rule 12.1.

## 5. Literature cited

Atkinson, I.A.E. 1981. *Vegetation map of Tongariro National Park, North Island, New Zealand*. 1:50 000. Botany Division, Department of Scientific and Industrial research, Wellington, New Zealand.

de Lange, P.J.; Rolfe, J.R.; Champion, P.D.; Courtney, S.P.; Heenan, P.B.; Barkla, J.W.; Cameron, E.K.; Norton, D.A.; Hitchmough, R.A. 2013: Conservation status of New Zealand indigenous vascular plants, 2012. *New Zealand Threat Classification Series 3*. Department of Conservation, Wellington. 70 p.

## Appendix A. Scientific and common names of plant species mentioned in the text.

Current threat status as listed by de Lange et al. (2013) is also shown.

Species	Common name	Conservation status
<i>Achillea millefolium</i>	yarrow	Introduced
<i>Acrothamnus colensoi</i>		Not threatened
<i>Agrostis capillaris</i>	browntop	Introduced
<i>Anthoxanthum odoratum</i>	sweet vernal	Introduced
<i>Brachyglottis bellidioides</i>		Not threatened
<i>Carmichaelia vexillata</i>	a dwarf broom	At Risk - declining
<i>Celmisia gracilentia</i>	common mountain daisy	Not threatened
<i>Discaria toumatou</i>	matagouri	Not threatened
<i>Festuca novae-zelandiae</i>	fescue or hard tussock	Not threatened
<i>Leucopogon fraseri</i>	patotara, dwarf mingimingi	Not threatened
<i>Lolium multiflorum</i>	Italian ryegrass	Introduced
<i>Melicytus alpinus</i>	porcupine shrub	Not threatened
<i>Medicago sativa</i>	lucerne	Introduced
<i>Muehlenbeckia axillaris</i>	creeping pohuehue	Not threatened
<i>Pilosella officinarum</i> (previously <i>Hieracium pilosella</i> )	mouse-ear hawkweed	Introduced
<i>Pimelea oreophila</i>	pimelea	Not threatened
<i>Plantago lanceolata</i>	narrow-leaved plantain	Introduced
<i>Plantago major</i>	broad leaved plantain	Introduced
<i>Rumex acetosella</i>	sheep sorrel	Introduced
<i>Rumex species</i>	dock species	Introduced
<i>Rosa rubiginosa</i>	sweet briar	Introduced
<i>Secale cereale</i>	ryecorn	Introduced
<i>Trifolium repens</i>	white clover	Introduced

## Appendix B: Photographs



*Photo 1. Wheat crop at Macaulay Block proposed pivot 1 site.*



*Photo 2. Exotic pasture at Macaulay Block proposed pivot 2 site.*



***Photo 3. Matagouri and sweet briar at Location (ii), amongst developed pasture at the proposed pivot 2 at the Macaulay Block.***



***Photo 4. Matagouri and sweet briar at Location (iii) in Figure 1.2, within developed pasture at proposed pivot 3 at the Macaulay Block.***



**Photo 5. South End block, location of proposed pivot 1.2A, currently planted in lucerne. Proposed pivot 1.2B would be located at the far left background of this photograph, in front of the pine shelter belt.**



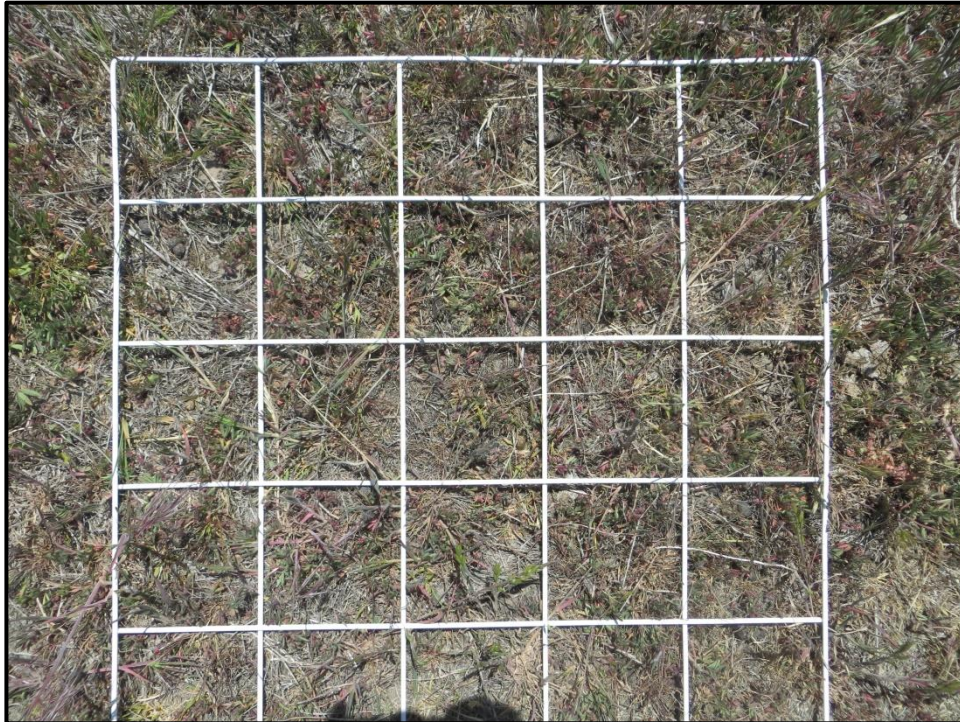
**Photo 6. Eastern side of pivot 1.2B at the South End block at location (i) in Figure 1.3. The photograph is taken from above Lilybank Road looking east toward Lake Tekapo. Vegetation comprises exotic pasture amongst patchy fescue tussock. Parallel lines are direct drill lines.**



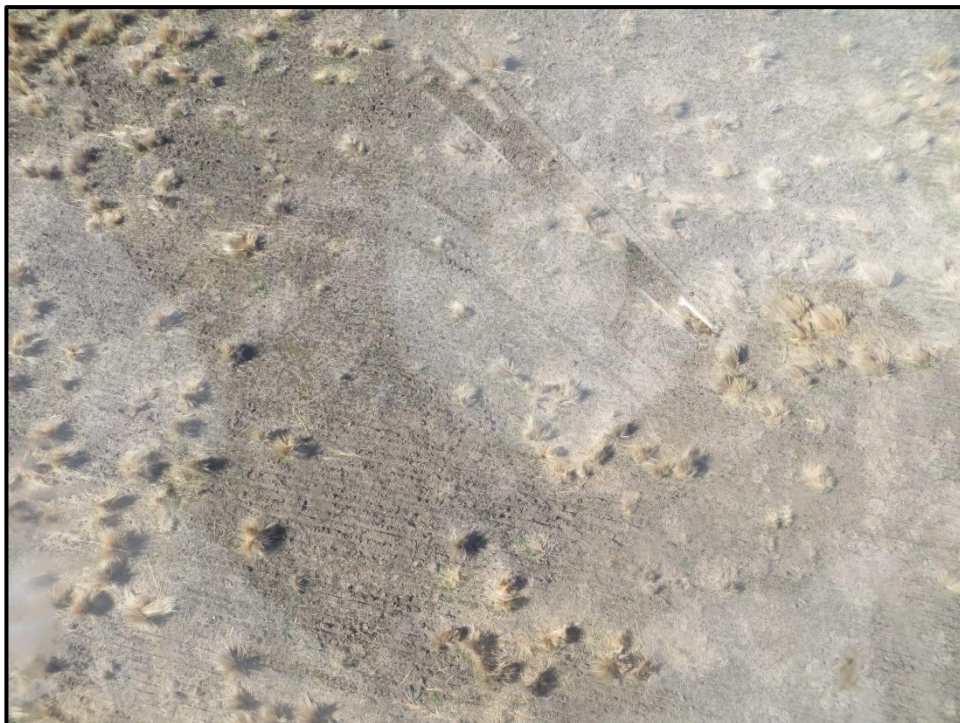
**Photo 7. Example of inter-tussock vegetation at location (i) in proposed pivot 1.2B, South End block.**



**Photo 8. Location of proposed pivot 1.3C in South End block. The fenceline corresponds to the line in Figure 1.3, with location (ii) as shown in Figure 1.3 to the left (west) and location (iii) to the right of the fenceline.**



***Photo 9. Vegetation within location (ii) of pivot 1.3.A.***



***Photo 10. Aerial view of proposed pivot 2.2B. Parallel lines are direct-drill lines.***



***Photo 11. Un-sprayed vegetation adjacent to proposed pivot 2.2B.***



***Photo 12. Unsprayed inter-tussock vegetation adjacent to proposed pivot 2.2B.***