Land Information New Zealand
Toitū te whenua

Crown Pastoral Land Tenure Review

Lease name : TWIN PEAKS

Lease number : PO 204

Conservation Resources Report

As part of the process of Tenure Review, advice on significant inherent values within the pastoral lease is provided by Department of Conservation officials in the form of a Conservation Resources Report. This report is the result of outdoor survey and inspection. It is a key piece of information for the development of a preliminary consultation document.

January 13

DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF

TWIN PEAKS PASTORAL LEASE

PAL 12-04-142

UNDER PART 2 OF THE CROWN PASTORAL LAND ACT 1998

PART 1

INTRODUCTION

1.1 Background

Twin Peaks Pastoral Lease (hereafter called "the property") is leased by HL and JA Brown. The property covers approximately 3535 hectares in the Upper Waitaki Basin in South Canterbury, on the southern side of the lower Ahuriri River. The southwest part of the property lies on the flanks of the Wether Range and is steep, rocky and sparsely vegetated. The northeast part covers gentler lower slopes and terraces of the outwash plain of the Ahuriri River. Altitude ranges from 500m at its northeast corner near the homestead to 1789m at its southwest boundary on the crest of the Wether Range. The property is drained by Manuka Creek and other unnamed tributaries of Omarama Stream, itself a tributary of the Ahuriri River, which drains to Lake Benmore (Waitaki River).

Twin Peaks Pastoral Lease lies at the boundaries of two ecological regions and three ecological districts. Higher southwest slopes lie in the St Bathans Ecological Districts (ED), within the Waitaki Ecological Region (ER). Lower-altitude northeast parts lie in the Omarama ED (Mackenzie ER). Between these two areas, a narrow swathe of the property along the lower hill slopes and upper terrace is in the Ahuriri ED (Mackenzie ER) (McEwen, 1987). The Mackenzie Ecological Region was surveyed as part of the Protected Natural Areas Programme (PNAP) in the early 1980s (Espie *et al*, 1984). The St Bathans ED has not been surveyed. No areas on the property have been recommended for protection under the PNAP.

The property adjoins Killermont Conservation Area at its northwest boundary on the Wether Range. It adjoins Killermont Run along the remainder of its northwest and northern boundary, Dunstan Peaks Pastoral Lease along its southeast boundary and Dunstan Downs Pastoral Lease along its southwest boundary. The main access to the property is from Omarama Lindis Pass Road (State Highway 8) via Broken Hut Road.

The tenure review inspection of the property was undertaken during December 2011 by a number of specialists.

PART 2 INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 LANDSCAPE

2.1.1 Landscape Context

Twin Peaks Pastoral lease is located in the far southwest of the Omarama Basin within the Upper Waitaki Basin of Canterbury. This Upper Waitaki Basin which encompasses the MacKenzie and Omarama Basins is the largest and probably the grandest intermontane basin in New Zealand and is widely recognised for its outstanding landscape values.

The property is located south of the Omarama Lindis Pass Road (SH8) on the north and northeast slopes of the semi-arid Wether Range. The Wether Range forms the boundary between Otago and Canterbury and is the enclosing range of the southern end of the Upper Waitaki Basin, merging with the St Bathans Range to the south. The property includes part of Manuka Creek catchment and unnamed tributaries of Omarama Stream all of which drain to the Ahuriri River and then to the Waitaki River.

The property includes three distinct zones: a narrow elongated portion of the extensive outwash surface of the Ahuriri River; the lower to mid front faces and foothills of the Wether Range; and, the upper slopes and summit ridge of the Wether Range.

South of the Wether Range are the headwaters of Dunstan Creek and the Manuherikia River which drain south to the Clutha catchment. North of the property across the wide braided Ahuriri River is the Diadem Range and east of the property is the Ewe Range. A narrow strip of alluvial terraces and floodplain border the Ahuriri River and, further north, the well known Clay Cliffs landform.

Reports on landscape values in the Mackenzie/Waitaki Basin by Boffa Miskell and Lucas Associates (1993) identified a range of attributes of the basin as a whole, including:

'the variety, the huge scale and clear expression of landforms as well the basin's visual character particularly its openness, vastness, and strong horizontal emphasis. Other distinctive characteristics were general absence of trees, overwhelming dominance of landform, high apparent naturalness, tussockland character and overall unity, simplicity and coherence of the landscape'.

The Mackenzie and Upper Waitaki basins have strongly defined enclosing ranges and very long wide views. The overwhelming dominance of landform, including mountains, hills, terraces, fans, huge outwash and alluvial surfaces, lakes and rivers contribute to high landscape values throughout. The basins still retain significant areas of shrubland and extensive wetlands, although these components are increasingly threatened.

2.1.1 Landscape Description

For the purposes of this landscape assessment, Twin Peaks Pastoral Lease is divided into three landscape units, reflecting areas of similar landscape character. For each landscape unit, landscape character is evaluated using the following criteria:

- Naturalness: the condition of the natural vegetation, patterns and processes and the degree of modification present.
- Legibility: expressiveness: how obviously the landscape demonstrates its formative processes.
- Aesthetic Factors: Distinctiveness is the quality that makes a particular landscape visually striking; frequently this occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern. Coherence is based on characteristics including intactness, unity, continuity, and compatibility (intrusions, alterations, disruptions tend to detract from coherence).
- Historic Factors: historically valued attributes in the context of a high country landscape.
- Visibility: the visibility of the landscape from public vantage points.

Landscape Unit 1: Ahuriri River Terraces (see Map 4.2.2)

This area comprises outwash flats with developed paddocks and conifer shelterbelts, and undeveloped flats that have never been cultivated. The developed land is mainly confined to the western portion of the outwash terrace against the base of the Wether Range and a strip along the southeast property boundary. The uncultivated land is on the northern portion of the outwash terrace and is contiguous with uncultivated outwash surfaces on adjoining land.

Vegetation on the undeveloped flats is sparse and dominated by hawkweed, sheep's sorrel, pasture grasses and scattered native plants. At the time of inspection the sorrel seed head imparted a distinctive red hue over a large area of the flats. The developed land has been converted to pasture and forms a patchwork of hay paddocks, sown pasture, feed crops and shelterbelts.

The lack of structures and farm development on the undeveloped flats is in marked contrast to the developed parts of the flats within the property and on adjoining properties. The lack of structures and introduced features also has the effect of emphasising the horizontal plain, scale and vastness of the outwash surfaces. This effect is especially noticeable with elevation, such as when viewed from the Wether Range.

Extensive development of wetlands and outwash surfaces is occurring to the southeast on the adjoining property.

Visual and Scenic Values

The developed land is typical of farmland in the Upper Waitaki Basin. It is visible in distant views from the highway. The farmland on its own doesn't have any particular values except for its visual values as part of the recognised Mackenzie/Upper Waitaki Basin landscape.

The visual values of the undeveloped outwash flats are the vast, barren, open and uncluttered landscape that the public and visitors associate with the Mackenzie/Upper Waitaki Basin. The outwash flats are special for their scale and simplicity and because the underlying landform is not masked by farm development.

Table 1: Evaluation Summary

Criteria	Value	Comment
Naturalness	low	Natural vegetation highly modified. Some native component.
Legibility	medium to high	Undeveloped areas are high, i.e. the formative processes of the original outwash surface can be seen, understood and interpreted in the landscape.
Aesthetic Factors	medium	The developed farmland is typical of grazed and cultivated paddocks of rural farmland. The uncultivated area forms part of the greater outwash surfaces of the basin which have intrinsic visual values derived from scale and simplicity. The degraded state of the vegetation detracts from aesthetic values to some extent.
Historic Factors	low	Unknown
Visibility	medium	Part of the wider undeveloped outwash surfaces of the basin, which have inherent visual values. Forms part of distant views from SH8.

Landscape Vulnerability

The undeveloped land is vulnerable. Farm development would alter the characteristics of the open outwash surface, introduce features and structures associated with more intensive farming and mask the underlying landform. The legibility of the landscape would be compromised.

Landscape Unit 2; Wether Range Lower Dissected Hills (see Map 4.2.2)

The Wether Range foothills rise fairly abruptly from the basin-floor flats. This landform comprises the dissected hillslopes, rolling hills and uplands across the mid section of the property. The landform comprises broadly rounded slopes dissected by numerous gullies and ridges. Broad rounded ridges occur between 700 and 900m on the central spur.

The unit includes the northwest faces above Manuka Creek, the middle spur and the southern faces of the unnamed tributary of Omarama Stream, including a small sliver of alluvial flats within this catchment next to the boundary of Dunstan Peaks. It is a generally homogenous area consisting of extensive sweet brier (*Rosa rubiginosa*)-matagouri (*Discaria toumatou*) shrubland, short tussock, pasture (including sheep's sorrel) and hawkweed. Sweet brier is largely confined to lower-altitude slopes and gullies. The area has been over-sown and top-dressed.

The broad middle spur and rounded foothills of the broad range support extensive pasture with scattered short tussock. Isolated shattered rock outcrops and scattered rocks are features across the foothills and lower slopes. A four-wheel-drive access track and fence follow the spur. The south face below the spur supports pasture, hawkweed and patchy shrubland. The only structures within this unit are a fertiliser shed (beside the airstrip) and fences.

Visual and Scenic Values

The visual and scenic values of these lower and middle slopes are related to landform and its position within the enclosing ranges of the basin.

Table 2: Evaluation Summary

Criteria	Value	Comment
Naturalness	low	Highly modified, with few natural vegetation patterns.
Legibility	medium	Underlying landform and formative processes are reasonably legible.
Aesthetic Factors	medium	Typical hill country. Not striking, memorable or distinctive. Significance is related to the range and basin as a whole.
Historic Factors	low	Unknown
Visibility	high	Forms part of the enclosing ranges and a backdrop to the basin.

Landscape Vulnerability

As with all the enclosing ranges of the Mackenzie/Upper Waitaki Basin, the slopes of the Wether Range are visible over a wide area and vulnerable to landscape modification. Vegetation patterns are modified but the landform is dominant and is the defining characteristic. Landscape values are vulnerable to forestry and wilding tree spread (though not an issue at present).

Landscape Unit 3: Wether Range Upper Slopes and Summit (see Map 4.2.2)

The boundary of this unit is the mid slope fenceline, between the more developed hill country and the less-developed upper slopes. The line is clearly visible on the range when viewed from the basin floor, as a contrast between the green developed lower slopes and the brown/grey/green mid to upper slopes. The steep slopes of this unit ease at around 1400m on the central spur before rising steeply to the summit ridge.

Lower slopes within this unit appear depleted. Shattered rock, scree, speargrass, sheep's sorrel and hawkweed give this area a barren appearance. There is a significant difference between the tussock cover on the north and south side of the fence running up the spur. Snow totara (*Podocarpus nivalis*) occurs at rocky areas.

The shoulder of the central spur supports short tussock, depleted snow-tussock, extensive areas of pavement and patches of prostrate dracophyllum. The east and south faces of a spur at the head of the unnamed stream support extensive areas of brownish/red dracophyllum associated with scree and rock pavements. Lower down at the base of the same spur is a large cluster of rock outcrops and associated shrubland. Slopes above 1400m have high natural character.

There is a vehicle track up the steep rocky face to the summit of the Wether Range. The upper slopes and summit area form broad sweeping rounded mountain tops with gentle basins, extensive grey-coloured scree, and rocky pavement broken by cushionfield. Dominant species include low slim snow-tussock and prostrate dracophyllum. The dominant feature of the upper slopes is expansive areas of shattered rock and scree. Peri-glacial features including snowbank hollows and lag surfaces are also present.

As well as the vehicle track up the main spur there is another track up the western spur next to Killermont Conservation Area and a more recent track (not shown on the 1:50,000 topographical map) on the south face at the head of the unnamed stream. This latter track has created a significant scar.

Visual and Scenic Values

The upper slopes and summit have high inherent visual values. There remains a high level of natural character and coherence. All natural patterns and processes are intact. Landform is overwhelmingly the dominant feature and is visually striking and impressive. The broad windswept summit area and upper basins are particularly impressive.

Views from the upper slopes and the summit are huge and spectacular. The summit provides a 360º panorama to include the headwaters of the Manuherikia River all the way to the Pisa Range and beyond. To the north and northwest is Aoraki/Mount Cook, the head of the Huxley valley and the expanse of the Waitaki Basin and surrounding mountains.

Table 3: Evaluation Summary

Criteria	**Value**	**Comment**
Naturalness	high	Natural character intact.
Legibility	high	Formative processes including peri-glacial and wind erosion are very legible.
Aesthetic Factors	high	Visually impressive and distinctive.
Historic Factors	low	Unknown
Visibility	high	Visible over a wide area of the Waitaki Basin

Landscape Vulnerability

The upper slopes and summit are high alpine zones and are fragile and vulnerable to any form of land use and change. Grazing and burning appears to have already had a significant impact on vegetation patterns.

Significance of Landscape Values

The scale and prominence of the landforms on the property and their contribution to the wider Mackenzie/Waitaki Basin landscape are significant values. Also significant is the open uncluttered character of the undeveloped outwash terrace. The distant higher slopes of property are clearly visible from an important tourist highway.

2.2 GEOLOGY, LANDFORMS AND SOILS

2.2.1 Geology

The basement rocks of Twin Peaks Pastoral Lease, exposed on higher slopes, are Rakaia terrane rocks comprising non-schistose to schistose quartzofeldspathic sandstone (greywacke) inter-bedded with mudstone (argillite) of Triassic age. These rocks are overlain in higher-altitude basins with boulder till and rock glacier deposits. Lower altitude fans and slopes comprise recently deposited (Holocene) boulders, gravel, sand and clay. The gentler main outwash terrace comprises recently-deposited gravel, sand and silt. The Hawdun Fault system converges to the east of the property along the upper Omarama Stream valley (Forsyth, 2001).

2.2.2 Landforms

Three distinct landforms are present on the property: rocky higher-altitude ridges and basins; broad-shouldered mid-altitude slopes; and gentler low-altitude fans and terraces. The mountain basins have extensive exposed rock, including glacial and peri-glacial deposits (moraines and rock patterning). Mid-altitude slopes are relatively steep and dissected by steep-sided gullies. Fans and terraces are broad and gentle, typical of those throughout the Mackenzie/Waitaki Basin.

2.2.3 Soils

Higher altitude parts of the property on the mountain ranges have poorly-developed Kaikoura steepland soils. Mid-altitude slopes have Kirkliston hill soils and Omarama steepland soils, with Meyer stony silt loam on lower slopes. The gently-sloping fans on the property are predominantly Dalgety shallow soils with a smaller area of Dobson shallow soils. The undeveloped outwash terrace has Mackenzie shallow soils.

2.2.4 Land Use Capability (see Map 4.2.4)

All higher-altitude parts of the property (above approximately 800m) are non-arable land with severe to extreme limitations for land use (Class 7e and Class 8e). Lower slopes are non-arable land with moderate limitations (Class 6e). The gently-sloping fans have moderate limitations for arable land use (Class 4s) and the undeveloped outwash terrace is non-arable land with moderate limitations (Class 6s).

Significance of Geology, Landforms and Soils

The geology, landforms and soils of the property are representative of the Waitaki Basin. They are contiguous with similar landforms on adjacent properties which together give the basin its distinctive character. Significant landforms on the property are the relatively extensive rock deposits in higher altitude basins, rock patterning on summit ridges and the undeveloped lower-altitude outwash terrace.

2.3 CLIMATE

The property has a semi-arid mountain climate with cold winters and warm dry summers. Predominant winds are from the northwest, with occasional gales. Snow can affect all parts of the property and lies for several months at higher altitudes over winter. Average annual precipitation is between 600 and 800 mm (Tomlinson, 1976). The climate of the area is strongly influenced by the sheltering effects of the Southern Alps, resulting in drier conditions than occur in most of New Zealand's other mountain environments.

2.4 LAND ENVIRONMENTS OF NEW ZEALAND (LENZ) (see Map 4.2.2)

LENZ is a classification of New Zealand landscapes using a comprehensive set of climate, landform and soil variables chosen for their role in driving geographic variation in biological patterns (Leathwick *et al,* 2003). The units of LENZ (land environments) are areas of land having similar environmental conditions regardless of where they occur in New Zealand. Therefore LENZ provides a framework that allows prediction of a range of biological and environmental attributes including the character of natural ecosystems, the vulnerability of environments to human activity and the potential spread or productivity of new organisms (Leathwick *et al,* 2003). LENZ data are presented at four levels of detail, with Level I containing 20 environments, Level II containing 100 environments, Level III containing 200 environments and Level IV containing 500 environments.

In an analysis of the LENZ Level IV data, remaining indigenous vegetation cover and the extent of legal protection, Walker *et al.* (2005) proposed a threat classification for New Zealand's land environments based on two components of vulnerability (likelihood of loss): legal protection and risk of loss. This threat classification (Table 4) has become the recognised benchmark for the promotion of threatened LENZ conservation.

Table 4: LENZ threat categories and definitions (Walker *et al.* 2005)

Category	**Criterion**
acutely threatened	<10% indigenous cover remaining
chronically threatened	10-20% indigenous cover remaining
at risk	20-30% indigenous cover remaining
critically under-protected	>30% indigenous cover remaining <10% legally protected
under-protected	>30% indigenous cover remaining 10-20% legally protected
no threat category	>30% indigenous cover remaining >20% legally protected

On the property a small low-altitude area of alluvial fan (Dobson shallow soils) at the lease boundary next to a large wetland on the adjacent property lies within a "chronically threatened" land environment (N7.1a). All other low- and mid-altitude parts of the property (below approximately 1000m) lie within "critically underprotected" land environments (N6.1a, N6.1b, N4.1c, Q2.1a and Q2.2a), except for small valley bottom areas which lie in "at risk" land environments (E4.1b and K3.1a). Upper slopes (between approximately 1000 and 1400m) lie within "underprotected" land environments (Q1.1b and Q1.1c). The highest-altitude parts of

the property on the summit ridges lie within "less reduced and better protected" land environments (Q1.1a and Q1.2a).

Significance of Land Environments

Approximately two-thirds of the property lies within chronically threatened, at-risk or critically underprotected land environments. These land environments comprise all those areas below approximately 1000m altitude.

2.5 VEGETATION

2.5.1 Ecological Context

The original (pre-human) vegetation above tree line (c.1200m) on the property was probably dominated by narrow-leaved snow tussock (*Chionochloa rigida*) and slim snow-tussock (*C. macra*) communities, with a wide array of sub-alpine shrubs and herbs. Below tree line the original vegetation is likely to have been thin-bark totara (*Podocarpus cunninghamii*) and broadleaf (*Griselinia littoralis*) forest, scrub, shrubland and tussockland (Espie *et al*, 1984, McEwen 1987, Leathwick *et al,* 2003). As a result of Polynesian burning and European pastoral farming most of these plant communities have been lost or are highly modified (McGlone, 2001), except at higher altitudes where the vegetation remains broadly representative of that originally present.

The dominant native plant communities on the property include narrow-leaved snow-tussock and slim snow-tussock communities, small leaved shrublands and short tussock (*Festuca novae-zelandiae*) grasslands, which collectively form extensive cover over much of the property. Some lower altitude parts of the property have been over-sown and top-dressed and contain lower native plant diversity as a result. Some of the fans and flats have also been cultivated and are dominated by crops and/or pasture species.

2.5.2 Vegetation and Flora

The property is divided into three botanical survey units for this description of the vegetation.

- Unit 1 = Mountainous landforms above 1000m
- Unit 2 = Lower mountain slopes, foothills and valley floors below 1000m
- Unit 3 =Alluvial outwash plain/terrace on basin floor

Unit 1: Mountains

Unit 1 covers the upper slopes of the Wether Range above 1000m to the ridge crest at around 1800m. It comprises steep slopes, ridges, upper gullies, screes, minor cirque basins, all of which are characteristic of the sub-alpine and alpine zones of the Wether Range.

Narrow-leaved snow-tussock and slim snow-tussock comprise the dominant plant communities of this unit and form extensive cover. These tussock species occur in sequence, with narrow-leaved snow-tussock the dominant cover to around 1500m, above which slim snow-tussock is dominant and is interspersed with extensive scree and fellfield at high altitudes.

Narrow-leaved snow-tussock cover varies depending on aspect. Sunny faces have sparser cover typically 15 to 25%, compared to shady southern slopes where cover is often around 40%.

Narrow-leaved snow-tussock cover fades to very sparse at lower altitudes (below 900m), especially on sunny slopes. The major central spur was notably denuded of snow tussock cover as a result of stock camping and what appears to be recent fire.

Slim snow-tussock follows a similar pattern, with greater coverage on southern aspects. Overall the coverage of slim snow-tussock is sparser than that of narrow-leaved snow-tussock, probably due to its greater palatability and its location at higher altitude. The central spur in upper part of this unit was particularly denuded of snow tussock leaving extensive bare patches, especially on gentle slopes.

A high diversity of native plant species is associated with these snow tussock communities. Common native species include fescue tussock, mountain fescue tussock (*Festuca matthewsii*), *Raoulia subsericea*, blue tussock (*Poa colensoi*), dwarf heath (*Leucopogon fraseri*), golden speargrass (*Aciphylla aurea*), mat coprosma (*Coprosma petriei*), mat broom (*Carmichaelia vexillata*), grassland daisy (*Celmisia gracilenta*), matagouri (*Discaria toumatou*), *Carex breviculmis*, mountain heath (*Acrothamnus colensoi*), snowberry (*Gaultheria depressa*), blue wheat grass (*Elymus solandri*), harebell (*Wahlenbergia albomarginata*), native aniseed (*Anisotome flexuosus*), *Deyeuxia avenoides*, woodrush (*Luzula rufa*), grassland buttercup (*Ranunculus multiscapus*), *Brachyglottis bellidioides*, sun orchid (*Thelymitra longifolia*) and onion orchid (*Prasophyllum colensoi*). Reasonably large patches of *Dracophyllum pronum* are also present on mid-upper sunny slopes. Common and often locally abundant exotic species include mouse-ear hawkweed (*Pilosella officinarum*), king devil hawkweed (*Pilosella piloselloides subsp. praealta*), tussock hawkweed (*Hieracium lepidulum*), browntop (*Agrostis capillaris*), sheep's sorrel (*Rumex acetosella*), sweet vernal (*Anthoxanthum odoratum*) and catsear (*Hypochoeris radicata*).

The composition and abundance of the various native species change with increasing altitude, most notably with mat broom, matagouri, golden speargrass and mountain heath fading out above 1500m. Other species become common with increasing altitude, including mountain fescue tussock and *Anisotome imbricata* var. *prostrata*. All exotic species become less common and less abundant with increasing altitude, with only mouse-ear hawkweed occurring frequently, albeit sparsely, at the highest altitudes.

Depleted spurs are characterised by large areas of bare ground (c.25%), talus and mixed native and exotic herbfield, which is especially common on gentle slopes. Tussock is typically sparse with slim snow-tussock forming less than 1% cover and often reduced to heavily chewed stumps. Common exotic species include browntop, mouse-ear hawkweed, sweet vernal, king devil hawkweed and sheep's sorrel. Common native species include *Carex muellerii* (large diffuse patches), *Brachyscome longiscapa, Scleranthus uniflorus, Anisotome imbricata* var. *prostrata, Poa lindsayi*, spineless bidibid (*Acaena inermis*), native chickweed (*Stellaria gracilenta*), *Montia sessiliflora* and *Agrostis muscosa* (the latter two in damp depressions).

Rock tors occur throughout the Wether Range but overall contribute a relatively minor habitat. Tors often support remnant shrublands of *Coprosma dumosa*, porcupine shrub (*Melicytus alpinus*), *Pimelea traversii*, *Coprosma cheesemanii*, coral broom (*Carmichaelia crassicaule*), mat pohuehue (*Muehlenbeckia axillaris*), golden speargrass and *Carmichaelia petriei*. Herbaceous species commonly present are blue tussock, *Rytidosperma corinum*, *Geranium brevicaule*, native chickweed, *Raoulia parkii, Luzula rufa* var. *albicans, Crassula sieberiana*, *Scleranthus uniflorus*, and the ferns *Blechnum penna-marina*, thousand-leaved fern *(Hypolepis millefolium*) and *Asplenium flabellifolium.*

Screes, fellfield and open stony ground occupy reasonably large areas on the upper steep slopes, cirque basins and spurs. Although predominantly open and rocky, these habitats support

interesting plants adapted to harsh unstable conditions. Species recorded include *Hebe epacridea, Ranunculus crithmifolius* var. *crithmifolius, Epilobium tenuipes, Hebe buchananii, Aceana* spp, *Myosotis suavis, Aciphylla monroi*, *Raoulia petriensis, Phyllachne colensoi, Dracophyllum muscoides, Carex wakatipu, Dracophyllum pronum, Chionohebe pulvinaris*, edelweiss (*Leucogenes grandiceps*), *Leptinella pectinata* subsp. *villosa*, *Celmisia lyallii* X *verbascifolia*, *Colobanthus monticola* and mountain fescue tussock.

Flushes and seeps are also present in depressions and in cirque basins. These support extensive comb sedge (*Oreobolus pectinatus*) cushionfields and interesting turf communities comprising a diversity of small herbaceous species. Species recorded include *Ranunculus maculatus, R. gracilipes, R. cheesemanii, Plantago triandra, Psychrophila obtusa, Leptinella pusilla, Eleocharis pusilla, Crassula sinclairii, Colobanthus strictus, Abrotanella caespitosa, Celmisia sessiliflora, Coprosma perpusilla, Rytidosperma australe, Celmisia argenta, Carex gaudichaudiana, Gaultheria parvula, Oreomyrrhis colensoi* var *delicatula, Cardamine uniflora, Epilobium komarovianum, Juncus antarcticus* and *Anisotome aromatica.*

Shrublands are generally confined to the riparian zone in gully heads. These are part of more extensive lower-altitude shrublands and are discussed in the following section.

Unit 2: Lower Mountain Slopes, Foothills and Valley Floors

This unit encompasses the lower slopes and front faces of the Wether Range from 1000m down to the alluvial flats. The front faces tend to be substantially modified, presumably from top-dressing and/or over-sowing, and as a result support extensive areas of exotic sweet brier (*Rosa rubiginosa*), exotic grasses and herbs. Less modified gullies support extensive shrublands and form relatively intact ecological sequences with the higher-altitude plant communities described above.

Shrublands typically occur along gullies and riparian margins, often with sweet brier. Despite appearing highly modified, surprisingly diverse and intact shrublands occur in some of the more steeply incised gullies within this unit and form extensive and dense cover across some steep shady slopes. Shrubland composition tends to be dominated by a mixture of *Coprosma propinqua, Olearia odorata*, mountain wineberry (*Aristotelia fruticosa*), porcupine shrub, *Carmichaelia petriei*, common broom (*Carmichaelia australis*), matagouri and tauhinu (*Cassinia leptophylla*). Also present, but less common, are *Coprosma intertexta, Coprosma taylorii, Corokia cotoneaster, Olearia bullata, Hebe salicifolia* and *H. rakaiensis*. Scattered trees of kowhai (*Sophora microphylla*) (rare in the ED) occur along the front faces, typically midslope, and often include seedlings and saplings. These shrublands support an abundance of climbers, including relatively large populations of the nationally threatened climbing broom (*Carmichaelia kirkii*) and the uncommon native jasmine (*Parsonsia capsularis* var. *rosea*). Other common climbers include *Rubus schmidelioides*, *Clematis marata* and *Muehlenbeckia complexa.*

Relatively sparse (<15% cover) fescue tussock grasslands dominate the spurs and upper slopes of this unit. Matagouri is common and scattered throughout. Occasionally present are silver tussock (*Poa cita*), narrow-leaved snow-tussock, *Pimelea traversii, Carmichaelia vexillata*, coral broom and *Coprosma propinqua*, especially on broken stony ground and rocky outcrops. Iinter-tussock vegetation is typically highly modified and dominated by exotic grasses, especially browntop and sweet vernal. Mouse-ear hawkweed is common as are numerous exotic annual species such as field speedwell (*Veronica arvensis*), grass forget-me-not (*Myosotis discolor*), hawksbeard (*Crepis capillaris*), to name a few. Native grasses and herbs are also present, and include *Rytidosperma pumilum, Geranium brevicaule* and *Raoulia subsericea.* The uncommon grassland greenhood orchid (*Hymenochilus tristis*) was observed at several places among modified fescue

tussock grassland. Fescue tussock grasslands become more natural as they grade into narrow-leaved snow-tussock at higher altitudes.

Impressive shrublands occur along the 'unnamed' stream that forms the southern boundary to the property. Here riparian shrublands (as described earlier) form mosaics with subalpine species that occur on talus slopes and at higher altitudes. Species present include inaka (*Dracophyllum longifolium*) (south-facing slopes), mountain flax (*Phormium cookianum*), *Brachyglottis cassinioides, Olearia nummularifolia*, snow totara (*Podocarpus nivalis*), mountain ribbonwood (*Hoheria lyallii*) and *Gaultheria crassa*. Sweet brier is notably sparse in this catchment and native shrublands form relatively extensive cover across both catchment slopes (more open and less diverse on sunny aspects), where they merge with fescue tussock and narrow-leaved snow-tussock communities. Several patches of thin-bark totara (*Podocarpus cunninghamii*) are present on talus slopes including hybrids with snow totara, which forms part of this shrubland sequence.

Wetlands are confined to riparian margins and are limited in extent. It appears that wetlands were once present, including extensive areas on the adjoining property (Dunstan Peaks), but they have been mostly lost to development. *Carex virgata*, bog rush (*Schoenus pauciflorus*), spike sedge (*Eleocharis acuta*), buttercup *(Ranunculus amphitrichus*), and *Carex flagellifera* are the common native wetland species present.

Unit 3 Alluvial Outwash Plain

Unit 3 comprises the uniform alluvial flats. Most of these have been developed in some form and support exotic pasture and/or crops. A large area of undeveloped terrace is present at northern corner of the property on the broad Ahuriri River outwash plain. This terrace is very depleted, comprising a considerable amount of bare ground (c.40%) and is dominated by exotic species, chiefly browntop, mouse-ear hawkweed and sheep's sorrel, with various exotic annual species such as field speedwell, silvery hair grass (*Aira caryophylla*), mouse-ear chick weed (*Cerastium fontanum*), catchfly (*Silene gallica)*, whitlow grass (*Erophila verna*) and grassland forget-me-not (*Myosotis discolor*). Native species are very sparsely distributed throughout but nonetheless collectively comprise an interesting array of species that are representative of undeveloped basin floor outwash surfaces. These include mat broom, mat pimelea (*Pimelea pulvinaris*), *Rytidosperma thomsonii*, *Rytidosperma pumila*, harebell (*Wahlenbergia albomarginata*), plume grass (*Dichelachne crinita*), *Pyrrhanthera exigua*, blue tussock, scab weed (*Raoulia australis*), *Raoulia parkii*, *R. hookerii* var. *apicinigra, R. subsericea, Carmichaelia petriei*, fescue tussock, *Muehlenbeckia axillaris*, dwarf heath, onion orchid, sun orchid, matagouri, porcupine shrub, *Poa maniototo, P. lindsayii, Carex breviculmis* and lichen (*Condropsis sp.*).

Notable Flora

Notable plant species recorded on the property are listed in Table 5.

Table 5: Notable Plant Species, Twin Peaks Pastoral Lease.

Threat Division	**Threat Category**	**Species**	**Location on lease**
Threatened	Nationally Critical	*Oreomyrrhis colensoi* var. *delicatula*	Cirque basin cushion bogs.
At Risk	Declining	*Carmichaelia vexillata*	Narrow-leaved snow-tussock mid slopes, and outwash plain.
		Carmichaelia kirkii	Toe slope and foothill gully shrublands.
		Carmichaelia crassicaule	Rocky spurs.
		Hymenochilis tristis	Tussockland on midslopes and spurs.
		Pimelea pulvinaris	Outwash plain.
	Naturally Uncommon	*Ranunculus maculatus*	Wetland turf in cirque basin.
		Leptinella serrulata	Rocky spurs.
		Ranunculus crithmifolius subsp. *crithmifolius*	Alpine screes
Data Deficient		*Myosotis suavis*	Alpine screes and summit fellfield.
		Rytidosperma thomsonii	Outwash plain.
Relict		*Coprosma intertexta*	Toe slope and foothill gully shrublands.
Local Rarities		*Dichelachne crinita*	Outwash plain.
		Podocarpus cunninghamii	Lower gully slopes southern boundary stream.
		Parsonsia capillaris var. *rosea*	Foothills gully shrublands.
		Sophora microphylla	Foothills toe slopes.

Significant of Botanical Values (see Map 4.2.5)

The narrow-leaved snow-tussock and slim snow-tussock grasslands, subalpine shrublands and alpine rock, scree, and fellfield communities are significant as they are broadly representative of the native plant communities that originally occurred in these environments. Although they are somewhat depleted and their composition altered to a certain degree by grazing animals, they remain relatively intact and natural, and display natural variation associated with altitude, aspect and micro-topographical changes. They also support a diverse range of specialist habitats and associated native plant species that are expected to occur in these environments, including rare plant species (discussed below), and naturally rare ecosystems and associated plant communities, such as wetland turf communities associated with seeps and flushes.

Thin-bark totara remnants and associated gully and valley floor shrublands are significant as they are representative of the original pre-human vegetation below the natural tree line (Leathwick *et al,* 2003). Those that occur in Manuka Creek and along the southern boundary

stream are of particular significance as they form part of intact altitudinal sequences from the valley floor to the alpine zone and lie within an at risk land environment.

Foothill gully shrublands lack the diversity and some of the structurally dominant species of the aforementioned shrublands. Nonetheless they are significant as they represent the shrubland mosaic originally present over extensive areas (Leathwick *et al,* 2003; Walker *et al,* 2003). These shrublands lie within a critically underprotected land environment.

On appearances, the alluvial outwash surface presents somewhat of a conundrum given its botanical values have been reduced to very sparse occurrences of native species. Nonetheless, this is a significant ecosystem that provides habitat for a variety of specialised and rare native plant species that occupy these 'extreme' surfaces, including *Pimelea pulvinaris, Carmichaelia vexillata, Raoulia parkii* and *Rytidosperma thomsonii*. It lies within a critically underprotected land environment (N6.1b) and is classified as a 'naturally rare' ecosystem (inland alluvial surfaces) which is a national priority for protection (MfE, 2007). These undeveloped outwash surfaces face immediate threat with the widespread development of land elsewhere in the Mackenzie/Upper Waitaki Basin.

Of the individual threatened plant species present on the property, the most significant is *Oreomyrrhis colensoi* var *delicatula* (nationally critical) (de Lange *et al*, 2009). Species listed in the declining and naturally uncommon categories are considered to be at risk (Table 5). These species typically have small widely scattered populations and a slow decline rate, although a new threat could rapidly deplete their populations. Several other species on the property are notable as they are locally or regionally rare, such as kowhai, thin-bark totara and the native 'red' jasmine, despite not being ranked as nationally rare or threatened.

2.5.3 Problem Plants

Potential problem plants recorded on the property include sweet brier, Russell lupin (*Lupinus polyphyllus*), lodgepole pine (*Pinus contorta*) and red currant (*Ribes rubrum*). Sweet brier is very widespread, especially on the modified front faces, probably in response to top-dressing. It is unlikely to become a serious threat to the significant values identified, although it is common and co-exists with some notable shrublands. Russell lupin, lodgepole pine and red currant are all very localised and limited in extent. Control of these species would currently be relatively easy. A few Russell lupins were seen in the southern boundary stream. They pose a serious threat to the stony river bed habitats and they should be controlled to mitigate this threat. Lodgepole pine was only recorded in a few places within the southern boundary stream catchment. This species has the potential to become a major threat to conservation values if left uncontrolled and it should be eradicated as soon as possible. Red currant was recorded within an area of relatively low botanical values in a foothills gully. Control of this species is highly desirable to prevent further spread.

Overall the property contains numerous ubiquitous exotic species which are typical of pastoral properties in dryland environments. Most of these do not pose a serious threat to conservation values and in any case control would be impractical. Many common exotic species, such as mouse-ear hawkweed, are likely to decline with removal of stock. Other species, such as tussock hawkweed, are likely to persist and potentially increase regardless of management.

2.6 FAUNA

2.6.1 Birds and Lizards (see Map 4.2.5)

The birdlife of the Mackenzie/Upper Waitaki Basin comprises species of open habitats (stonefield, rock, grassland, tussockland, shrubland and wetland). Notable (threatened and at risk) bird species (Miskelly *et al*, 2008) recorded from adjoining Killermont, Dunstan Peaks and Dunstan Downs pastoral leases include banded dotterel (nationally vulnerable), black-billed gull (nationally endangered), black-fronted tern (nationally endangered), black shag (naturally uncommon), eastern falcon (nationally vulnerable), grey duck (nationally critical), New Zealand pied oystercatcher (declining), New Zealand pipit (declining) and pied stilt (declining) (Conservation Resources Reports (hereafter CRR), 2004; 2005 and 2006).

Although not on the property, the nearby Ahuriri River and delta provide internationally-significant habitat for wetland and braided river birds, with 55 species known from the area (Robertson *et al*, 1983). This river is less than two kilometres from the northern tip of the property; a distance that is easily travelled by foraging birds. The Ahuriri River is one of three areas that produced the majority of black stilt (nationally critical) fledglings over a seven-year period (Reed *et al*, 1993). It is also notable for black-fronted tern (nationally endangered): of 29 rivers included in a recent analysis of trends in breeding populations spread across the South Island, the Ahuriri River returned the highest median counts over a period of almost four decades (O'Donnell and Hoare, 2011). The size of the breeding population had previously been estimated at c.1200 terns (Jarman, 1987). Bittern (nationally endangered), banded dotterel (nationally vulnerable) and wrybill (nationally vulnerable) also breed in this braided river system (Robertson *et al*, 1983).

Ten species of lizard are found within DOC's Twizel Area (Herpetofauna Database), constituting 10% of New Zealand's lizard fauna (currently 100 recognized and proposed species; Hitchmough *et al*, 2010). The only notable lizard species recorded from adjacent pastoral leases has been spotted skink "Mackenzie Basin" (nationally vulnerable) (CRR, 2005).

Further afield, but within 30km of the property boundary, there are small, relict populations of grand skinks and Otago skinks (both nationally critical) on pastoral leases south of Lindis Pass, green skink (declining) records from Tara Hills Research Station and the Manuherikia valley, and scree skink (declining) records from several sites, including the St Bathans Range, Benmore Range and Black Jacks Island (Herpetofauna Database). There is also an unverified sighting of "green geckos" in tussockland at higher altitudes on Tara Hills (Espie *et al*, 1984). If accurate, this would have been a sighting of jewelled gecko (declining), the only species of green gecko known from South Canterbury (Herpetofauna Database).

Bird and lizard species observed on Twin Peaks Pastoral Lease are described below for two geographic areas of the property.

Unit 1: Northern Area

This area contains the part of Manuka Creek catchment that lies on the property and the lower-altitude flats. It is bounded to the north, west and southeast by the Killermont, Dunstan Downs and Dunstan Peaks pastoral lease boundaries, respectively, and to the northeast by the gravel road at property boundary. The Twin Peaks homestead is located in the far northeast corner. At the southwest corner of this area the Wether Range tops reach an altitude of almost 1800m, and are dominated by rockland and tall tussockland. Depleted short tussockland, rockland and stream gullies – some with sizable areas of mixed shrubland – are prevalent at mid altitudes, giving way to extensively-modified flats.

Native bird species recorded from this area were banded dotterel (nationally vulnerable) (one bird), black shag (naturally uncommon) (one bird), black-billed gull (nationally endangered) (one bird), black-fronted tern (nationally endangered) (one bird), grey warbler, New Zealand pied oystercatcher (declining) (five sightings: four of a pair of birds and one of a lone bird), New Zealand pipit (declining) (several sightings of lone birds), pied stilt (declining) (one bird), silvereye, southern black-backed gull, spur-winged plover, swamp harrier and white-faced heron. Eastern falcon (nationally vulnerable), although not recorded, is likely to forage in this area.

Threatened bird species were observed only in highly-modified areas on the basin floor: cultivated flats that had been drilled and sprayed, leaving bare soil and mostly dead vegetation (banded dotterel and black-fronted tern) or irrigated pasture (black-billed gull).

Introduced bird species observed were Australian magpie, blackbird, chaffinch, starling, dunnock, goldfinch, greenfinch, house sparrow, mallard, redpoll, skylark, song thrush and yellowhammer.

Common skink (five individuals), McCann's skink (20 individuals), Southern Alps gecko (30 individuals) and four unidentified skinks (most likely McCann's skink) were found throughout the hill country in this area. Geckos were restricted to rockland (rock outcrops, talus and stream beds), whereas skinks were found in a greater variety of habitats (rockland, grassland and shrubland).

Unit 2: Southern Area

This area contains a large portion of the catchment of an unnamed tributary of Omarama Stream. It is bounded to the north by a prominent ridge that separates this catchment from the Manuka Creek catchment and to the west and south by the property boundary. It contains steep hill slopes with extensive rockland, tall tussockland, depleted grassland and mixed shrubland.

Native bird species recorded from this area were grey warbler, New Zealand pied oystercatcher (declining) (one sighting of a pair of birds flying around the upper catchment), New Zealand pipit (declining) (at least six sightings of single birds), paradise duck, silvereye, southern black-backed gull and swamp harrier. Eastern falcon (nationally vulnerable), although not detected, is also likely to be present. Introduced bird species observed were Australian magpie, dunnock, goldfinch, redpoll, skylark and yellowhammer.

Common skink (two individuals), McCann's skink (42 individuals) and Southern Alps gecko (17 individuals) were recorded throughout this area. McCann's skink was particularly abundant on

scree slopes and in tall tussockland at mid-altitudes (c.1400–1600m). Although not detected, there was suitable habitat for spotted skink 'Mackenzie Basin' (i.e. scree and talus slopes with native vegetation, including tall tussock and shrubland species).

Bird Species Recorded

Twenty-seven bird species were recorded from the property, consisting of 14 native species (Table 6) and 13 introduced species. The introduced bird species recorded were Australian magpie, blackbird, chaffinch, dunnock, goldfinch, greenfinch, house sparrow, mallard, redpoll, skylark, starling, song thrush and yellowhammer.

Table 6: Native bird species recorded from Twin Peaks Pastoral Lease, December 2011

Species	Threat status	Distribution on property
black-billed gull	nationally endangered	Low-elevation flats
black-fronted tern	nationally endangered	Low-elevation flats
banded dotterel	nationally vulnerable	Low-elevation flats
black shag	naturally uncommon	Near Manuka Creek
New Zealand pied oystercatcher	declining	Irrigated pasture on flats and top of southern catchment
New Zealand pipit	declining	Tussocklands throughout
pied stilt	declining	Low-elevation flats
grey warbler	not threatened	Shrublands throughout
paradise shelduck	not threatened	Streambeds and pasture
silvereye	not threatened	Shrublands throughout
southern black-backed gull	not threatened	Throughout
spur-winged plover	not threatened	Lower elevations throughout
swamp harrier	not threatened	Throughout
white-faced heron	not threatened	Hedgerow on flats

Lizard species recorded

In total, 120 lizards representing three species (Table 7) were recorded from 43 sites on the property. This total represents seven common skinks, 62 McCann's skinks, 47 Southern Alps geckos and four unidentified skinks (most likely McCann's skink). Geckos were restricted to rocky areas (talus, rock outcrops, boulderfields and stream beds), whereas skinks were encountered in a greater variety of habitats (grassland, shrubland and rockland).

Table 7: Lizard species recorded from Twin Peaks Pastoral Lease, December 2011.

Species	Threat status	Distribution on property
common skink	not threatened	Grassland, shrubland and rockland throughout
McCann's skink	not threatened	Grassland, shrubland and rockland throughout
Southern Alps gecko	not threatened	Rockland throughout

Significance of the Bird and Lizard Fauna

The property provides feeding habitats for three threatened bird species: black-billed gull (nationally endangered), black-fronted tern (nationally endangered) and banded dotterel (nationally vulnerable). Although there is a lack of suitable breeding habitat for these species, such habitat is present nearby (the braided river bed of the Ahuriri River). Although not detected, eastern falcon (nationally vulnerable) is almost certainly present. The property also provides feeding and potential breeding habitats for four at risk bird species: black shag (naturally uncommon), New Zealand pipit, New Zealand oystercatcher and pied stilt (all declining). The property also provides feeding and breeding habitats for at least seven non-threatened native bird species (Table 6) and three non-threatened lizard species (Table 7).

2.6.2 Freshwater Fauna (fish and invertebrates)

Introduction

The property comprises two small catchments, Manuka Creek and an unnamed tributary which both feed into Omarama Stream which in turn flows into the Ahuriri River. The Ahuriri is in turn a major sub catchment of the Waitaki River.

Ecological Context

A distinguishing characteristic of the Waitaki River is the presence of eight hydro-electric dams along its length. This has two major effects on the fish communities within the river:

- Fish communities above the dams are generally composed of non-diadromous species (species without a marine phase in their lifecycle). Exceptions to this occur. Some longfin eels (*Anguilla dieffenbachii*) still remain in the river system and the normally diadromous common bully (*Gobiomorphus cotidianus*) and koaro (*Galaxias brevipinnis*) have become non-diadromous, substituting lakes for the sea.
- Fish communities are broken into separate populations, with little or no migration across dams. This means that re-colonisation of previously dewatered streams can only occur from within each dam catchment.

The Ahuriri River and its watershed which includes the property, is recognised as a 'Type I' waterway in the Waters of National Importance (WONI) documentation (Chadderton *et al* 2004). 'Type I' implies that the waterway contains special features of national significance. This significance relates to the presence of threatened bird and fish communities.

The predecessor to this work, Freshwater Environments of New Zealand (FENZ), used a matrix of variables to rank discrete sections of catchments by their importance. The streams on the property ranked as being of minor importance within the context of the Waitaki catchment.

The New Zealand Freshwater Fish Database records for the Waitaki River contains 1999 records comprising 23 fish species. Allibone *et al* (2010) ascribe threatened status to the following 12 of these species: longfin eel (declining), torrentfish (declining), koaro (declining), lowland longjaw galaxias (Waitaki River) (nationally critical), inanga (declining), bignose galaxias (nationally vulnerable), upland longjaw galaxias (nationally vulnerable), lamprey (declining), bluegill bully (declining), redfin bully (declining), Canterbury mudfish (nationally critical) and

Stokell's smelt (naturally uncommon). There are also records of the freshwater crayfish, koura (*Paranephrops* sp.), in the Waitaki catchment. Koura were listed by Hitchmough *et al* (2007) as being in gradual decline but now have no threat status.

Methods

The aquatic fauna survey for the property was undertaken on the 6th of March 2012. Macro-invertebrate surveys were carried out using samples collected both while electrofishing and from conducting thorough searches of waterway margins and substrate. Survey sites, for both fish and macro-invertebrates, were selected to cover the entire accessible aquatic habitat types present; utilising other known information from adjacent pastoral leases and previous freshwater survey work. Aquatic insects were identified using Winterbourn *et al* (2006) and a photo identification guide produced by the Otago Regional Council (1997).

Areas Surveyed

Ten sites on the property were surveyed for their freshwater fauna communities using standard electrofishing techniques.

For the purposes of the fish survey the property was split into two geographical units (blocks), defined by their topography. These units are the 'Front Flats Block' and the 'Wether Range Faces Block'.

'Front Flats Block': This area incorporates the northern flat to gently rising part of the property which adjoins Broken Hut Road and Shortcut Road. Hydrological features comprise small ephemeral streams, several water races which do not carry a continuous flow and some small wetlands. At the time of survey the section of Manuka Creek located upstream on adjoining Killermont Station was flowing; however the section within Twin Peaks was dry. The wetlands comprise "Palustrine – Seepages" using classification developed by Johnson & Gerbeaux (2004). These seepages have been heavily modified by agricultural development and cattle pugging.

The small stream that was surveyed was less than one metre in width and between 100 and 200 mm deep. No fish were recorded at this site. The wetlands all cover less than 100 m^2. The small stream surveyed has a silt base as do most ephemeral streams, water-races and wetlands. The dry bed of Manuka Creek has a component of gravels and cobbles, but is mainly silt based. There are two records from the NZFFD for brown trout in Manuka Creek.

Streams in this block have poor water quality, with worms being the only macro-invertebrates recorded.

'Wether Range Faces Block': This area encompasses those parts of the property that drain into Manuka Creek from the Wether Range and the unnamed catchments of Little Omarama Stream. Characteristic hydrological features comprise the permanent tributaries of Manuka Creek; an unnamed stream feeding into the Little Omarama Stream; a smaller unnamed stream between those listed previously and a small cirque basin wetland complex above the larger of the two unnamed streams.

The wetlands comprise "Palustrine – Fens" using classification developed by Johnson & Gerbeaux (2004). Fens have low to moderate acidity and are generally moderate to low in nutrients".

Stock have access to all water bodies in this block, although topographical barriers protect some discrete areas. The substrate of all the waterways comprises boulders and cobbles, with

occasional areas of gravel and bedrock. The wetland which is bisected by a terrace riser is over 100 m^2 in size. The underlying substrate is composed of gravel, sand and silt with scattered boulders.

Nine sites were surveyed in the 'Wether Range Faces Block'. Canterbury galaxias were found at four sites long a small stream between the two larger catchment streams and brown trout at the other five sites. There was no species overlap. There are no NZFFD records for this block.

The streams of the 'Wether Range Faces Block' have very good water quality, evident as evidenced by the presence of the mayflies: *Coloburiscus humeralis*, *Deleatidium lillii*-group, *Deleatidium myzobranchia*-group, *Nesameletus* sp. and *Rallidens mcfarlanei*; the stoneflies: *Stenoperla prasina*, *Zelandobius* sp. and *Zelandoperla* sp.; the caddisflies: *Aoteapsyche* sp., *Beraeoptera roria*, *Hydrobiosis frater*, *Hydrobiosis* sp., *Olinga feredayi*, *Pycnocentria* sp. and *Pycnocentrodes aeris*; the dobsonfly: *Archichauliodes diversus*; the two-winged flies: *Austrosimulium* spp., and Chironominae sp.; the flatworm: *Cura* sp.; and the worm: Oligochaete sp.

Two fish species were found during the survey in the Wether Faces Block. Canterbury galaxias (*Galaxias vulgaris)* was found at several locations in a small stream between the unnamed catchments of Little Omarama Stream and Manuka Creek. This native species has no threat status. Introduced brown tout (*Salmo trutta*) were present in the unnamed catchments of Little Omarama Stream and Manuka Creek.

Significance of Aquatic Fauna

No threatened aquatic species were found on the property. Bignose galaxias (nationally vulnerable), lowland longjaw galaxias (nationally critical), koaro (declining) and longfin eel (declining) are known from the area. It is possible that greater survey effort could yield established populations within property as suitable habitat is present.

Allibone *et al* (2010) rank bignose galaxias as nationally vulnerable, lowland longjaw galaxias as nationally critical and koaro and longfin eel as declining.

The Waters of National Importance (WONI) documentation (Chadderton *et al* 2004) recognises that the Ahuriri River Catchment is of Significant Value for its 'Type I' national importance. All sections of a 'Type I' catchments are assessed as being of national importance.

2.6.3 Terrestrial Invertebrates

The Wether Range straddles the boundary between Otago and Canterbury regions and the transition from Canterbury greywacke to Otago schist. Some biologists have suggested this change in geology is reflected by a disjunction of insect species, most notably beetles and moths (Emerson *et al,* 1997; Patrick, 1994). While geology may influence invertebrate distribution, a more important characteristic is the high level of invertebrate endemism across small areas of South Island high country and that the many species present are derived from a stock of characteristic groups. These invertebrate groups are consistent throughout the South Island and those recorded on the property share common forms expected in the eastern high country.

Invertebrates are described below for three distinctive parts of the property.

Unit 1: Upper slopes of the Wether Range (above 1200m)

Natural character is high throughout this portion of the property. The geomorphology is characteristic of the low-angled mountains in the district, with glacial features, open blocky scree slopes and alpine plant communities. Two cirque basins were visited in the area, each of which has small streams within its snow accumulation zone. The basins support wet-flush cushion herbfields with a scattering of snow-tussock peripheral to the herb and cushion surfaces.

All invertebrate species found in the alpine zone are endemic and the community composition is typical for each habitat and season. Species associated with the wet-flushes include tussock ringlet butterflies (*Argyrophenga antipodum*), day flying moths (*Asaphodes clarata* and *Paranotoreas brephosata*), craneflies (*Leptotarsus* sp.: Tipulidae), moss beetles (*Liochoria* sp.: Byhrridae) and several unidentified flies (Tachinidae, Syrphidae and Muscidae). Native flies are pollinators of the many small flowers of the cushion plants.

The scree slopes and rock pavement habitats also support a typical community of alpine invertebrates. Taxa include alpine butterfly (*Percnodaimon merula*), the larvae of which feed on snow-tussock shoots), cicada (*Maoricicada campbelli*), several alpine spiders (*Neoramia* sp.: Agelenidae) and the large black wolf spider (*Anoteropsis alpina*), which occurs up to 1800m and has a threat classification of sparse. These spiders are jet black (a heat retention adaptation) diurnal hunters that actively search for small invertebrates. The specimens collected were found no lower than 1700m, on or near the summit ridge of the Wether Range. At 1300m on the central spur of the property another wolf spider *Anoteropsis arescens* was noted. These diurnal hunting spiders are more common on high country river beds and have a threat classification of sparse.

Orthoptera were well represented on the upper slopes of the Wether Range. A significant find was the giant scree weta (*Deinacrida connectens*), a Southern Alps endemic with fastidious habitat requirements. These heavy, flightless and slow-breeding insects are prone to mammalian predation and habitat disturbance. Only two individuals were found (and left in situ) despite searching for other specimens over a considerable period. These weta may be at or near their eastern limit on the Wether Range. Populations can be locally abundant in the central Southern Alps where rainfall is higher and predation from introduced pests may be lower.

A second weta species found was *Hemideina maori* which, although common throughout the central Southern Alps, is useful as an indicator of low mammalian predation and intact (indigenous) community structure.

Grasshopper species of note included *Sigaus australis* (common to the eastern mountains) and *Brachaspis nivalis* which, although not abundant, are highly distinct and confined to the sub-alpine and alpine zones. All *Brachaspis* species are valuable indicators of intact indigenous ecological communities since they have strict habitat requirements.

Mid-altitude Zone (800-1200m)

This part of the property consists of a mosaic of modified and undisturbed habitats, presenting a challenge to interpret. The northeast (front) slopes are heavily modified through top-dressing and over-sowing. Modification is less pronounced in the gullies, creek systems and on slopes with dry aspects.

Indigenous shrubland at lower elevations supports a suite of host-specific native invertebrate taxa. By contrast, highly modified areas support abundant introduced invertebrates (including bumbles bees, honey bees, wasps, numerous pest fly species and butterflies). A grading from exotic to indigenous invertebrate communities was evident as the indigenous shrublands increased in area and diversity.

Invertebrates of conservation or scientific interest noted at these lower elevations included darkling beetles (*Mimopeus opaculus* and *Artystona* sp.), both amongst stable scree adjacent to indigenous woody shrubland. Grass moths (*Orocrambus* spp.) and Geometrid moths were abundant in *Olearia* shrubland. Species of *Olearia* and *Coprosma* are significant host plants for many native moths (Derraik *et al,* 2003).

A dense community of matagouri, *Olearia*, *Coprosma* and *Muehlenbeckia* shrubland is present on the valley floor of the unnamed creek on the Dunstan Peaks border of the property. *Muehlenbeckia* plants are a significant host for the boulder copper butterfly (*Lycaena boldenarum*) and the common copper (*Lycaena salustius*), both of which were present here.

The ecological condition of the lower unnamed creek is high. Native plant communities are intact and the invertebrate composition is high in native species. Numerous specimens of the native lax beetle *Selenopalpus aciphyllae* (Oedemeridae) where noted on golden speargrass (*Aciphylla aurea*), which is extensive in this catchment. These beetles bore their way into the stem of the plant and also feed on pollen.

Shrublands within the valley floor of the unnamed creek are of a single age structure, having colonised the river terrace. Green cicada (*Kikihia angusta*), were active at this location along with ranger dragonfly (*Procordulia smithii*) and red damselfly (*Xanthocnemis zealandica*). The common mayfly *Coloburiscus humeralis* was collected from the creek margin and the montane grasshopper *Sigaus australis* was abundant throughout this area.

Several specimens of a threatened (data deficient) spider (*Matua valida*) where found under stones in dry sunny locations at the headwaters of the unnamed stream. These spiders are quite common in northern Otago and southern Canterbury, but have not been found elsewhere in New Zealand.

Also present in this area is the ground beetle *Megadromus alternus*, which is known only from Central Otago, Mackenzie Basin and mid-Canterbury (Johns, 2005). *Megadromus alternus* beetles are flightless and have also been found on the nearby Omarama Pastoral Lease (CRR, 2005).

Below the 1200m contour, the effects of top-dressing and over-sowing are profound. Spurs and hill tops are heavily depleted and other areas are dominated by exotic grasses and weeds, particularly sweet brier. Indigenous invertebrate values are low in this area.

Ahuriri Outwash Surface

The area inspected here is approximately 3km^2 and represents the least modified surface at this part of the property. Despite an extensive cover of mouse-ear hawkweed, the original fluvial river channels are evident. One invertebrate of conservation interest is present: the grasshopper *Sigaus minutus* (threat rank: gradual decline). These grasshoppers are becoming confined to remnant habitats and their populations fragmented in the Mackenzie Basin as irrigation and cultivation increases.

Another noteworthy observation on these flats was the burrow holes of *Hexathele* trapdoor spiders and ground weta (presumably a *Hemiandrus* species). Unfortunately these taxa were not collected as insufficient time allowed for pitfall trapping and digging. However, there are no other invertebrates known in the Mackenzie Basin that produce holes in soil of the same diameter as trapdoor spiders and ground weta.

Species Recorded

Table 8: Notable invertebrate species recorded on Twin Peaks Pastoral Lease, December 2011

Species	Threat status/conservation value	Location on property
alpine wolf spider	*Sparse*. Large black spiders, restricted to the Southern Alps. Endemic genus and species.	Found from summit ridge to upper cirque basins on open rocky ground.
wolf spider	*Sparse*. Dark brown to black spiders. Occur on braided river beds and dry shingle country.	Noted on rocky pavement surface above 1300m.
stealthy spider	*Data Deficient*. Small, silvery spiders which live in silken retreats beneath stones. Restricted to North Otago/South Canterbury.	Collected from riverbed stones of unnamed catchment.
minute grasshopper	*Gradual Decline*. Small, distinct grasshoppers. Known only from the Mackenzie Basin and North Otago.	Collected from surface of undeveloped outwash plain.
alpine grasshopper	Endemic alpine species. Has indicator species value.	Alpine habitat, blocky scree.
giant scree weta	South Island alpine endemic. Restricted to rocky scree habitats above 1600m. At or near lowest altitudinal range on property.	Summit ridge and slopes immediately below.
mountain stone weta	Widespread endemic species of freeze tolerant weta. Diagnostic of low predation and intact habitat.	Rocky terrain, upper elevations of lease.
mountain ringlet butterfly	Endemic ringlet, confined to high altitude screes and tussock country of the Southern Alps. Potential indicator species.	Throughout upper elevations of lease, above 1600m.
ground beetle	Local endemic. *Megadromus alternus* is known only from Central Otago, the Mackenzie Basin and mid-Canterbury.	Beneath rocks, tussock.

Significance of the Invertebrate Fauna

The property is of considerable conservation value for terrestrial invertebrates, particularly above the 1200m contour. The values are principally the sub-alpine and alpine habitats and their associated endemic invertebrates. However, the creeks and gullies and their extensive indigenous shrublands are also of high ecological value for invertebrates. Also important is the undeveloped portion of the outwash flats at the northern corner of the property, where the rare grasshopper (*Sigaus minutus*) and burrow holes of trapdoor spiders and ground weta were observed. Lower modified hill slopes on the property have lower invertebrate values.

2.6.4 Problem Animals

Pest mammal species recorded on Twin Peaks Pastoral Lease were brown hare, brushtail possum, European rabbit, European hedgehog and weasel. The weasel was seen crossing a vehicle track in the Manuka Creek catchment. Although not detected, other introduced mammalian predators (feral cat, stoat and/or ferret and rodents) are likely be present. Their negative impacts on native bird and lizard populations are well-documented (e.g. Reed *et al*, 1993; Tocher, 2006).

2.7 HISTORIC

2.7.1 European Heritage Values

Lease History

The property was originally part of Omarama Run, first taken up in 1858 by Harrie Carr Robinson (unpublished advice from NZ Historic Places Trust).

Historic Sites

No known historic sites are present on the property. Survey work will be undertaken on land proposed for freeholding under a Preliminary Tenure Review Proposal.

Significance of Historic Resources

Subject to findings from futher survey work no significant historic sites are known to be present on the property. Ngai Tahu will supply LINZ with a separate cultural resources report outlining any pre European sites present.

2.8 PUBLIC RECREATION

2.8.1 Physical Characteristics

Twin Peaks Pastoral lease is dominated by the steep northeast slopes of the Wether Range and the gently-sloping fans and terraces of the basin floor. Landform is typical of mountains of the southern Waitaki Basin and is transitional in character between the mountains of South Canterbury and Otago. The Wether Range forms an alpine linkage from the Ahuriri River Valley with the St Bathans Range, the eastern flanks of which lie within the Oteake Conservation Park.

2.8.2 Legal Access

Roads

Broken Hut Road provides legal access to the northeast corner of the property. An un-named formed legal road provides access to the northern boundary of the property from Omarama Lindis Pass Road (State Highway 8).

Adjoining Public Conservation Land

The alpine basins of the property adjoin the Killermont Conservation Area to the north and public conservation land created as part of a tenure review of Dunstan Peaks to the south. This area in turn adjoins the Oteake Conservation Park.

Access to the southwest corner of the property on the upper slopes of the Wether Range is available from Killermont Conservation Area.

Marginal Strips

No existing marginal strips are present along streams within the property boundary. Manuka Creek and the lower reaches of the unnamed catchments of Little Omarama Stream appear to be qualifying waterways.

Easements

Easements secured through adjoining tenure reviews provide for public access to the Wether Range from SH8 and from Short Cut Road to the headwaters of Manuka Stream. A combination of legal roads and easements (some of which provide for vehicle access) provide for public access to adjoing conservation land and to Oteake Conservation Park on the northern Wether and St Bathans Ranges.

2.8.3 Activities

The most important existing recreational use of the property, in terms of visitor numbers, is probably scenery appreciation. Parts of the property, notably the higher slopes of the Wether Range are visible from a tourist highway (SH 8 Omarama-Lindis Pass Road).

The summit ridge and upper slopes of the Wether Range provide opportunities for back-country recreation such as tramping, skiing and nature study. Exisiting vehicle tracks provide 'desire lines' for access onto and across the Wether Range. The alpine basins and main ridge of the Wether Range form an obvious recreational linkage between the Mackenzie Basin, Oteake Conservation Park and the Manuherkia Basin in Central Otago. The property has potential to make up part of the venue for superb multi day linkages for foot, horse, mountain bike and ski. For example a multi day walking or ski trip is possible linking the Killermont easement from SH 8 adjacent to the Ahuriri River to Mt St Bathans with Hawkdun Runs Road in the upper Manuherikia catchment.

Significance of Recreation

Significant recreational features of the property are the contribution it makes to the spectacular scenery of the Mackenzie/Upper Waitaki basins, the highly-natural recreation setting at higher altitudes on the Wether Range and its strategic importance in providing important recreational linkages ranging from day walks to multi day traverses of the Wether and St Bathans Ranges. Recreational opportunities are complementary to those in Oteake Conservation Park and adjoining public conservation lands.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

Comments were received from the following parties during the preparation of this document.

Central South Island Fish and Game Council
The Council advises that Manuka Creek supports a self-sustaining brown trout fishery, Omarama Stream supports high-value fishery and spawning sites for rainbow trout and brown trout, and that the property provides some opportunities for upland game bird hunting (chukor and quail). The Council requests that stream banks and water quality be protected from intensive land uses, that access be provided to Omarama Stream for fishing, and that public access is maintained along all existing legal roads and foot routes on the property.

New Zealand Historic Places Trust
The Trust notes that while no historic places, historic areas or archaeological sites are recorded from the property, there are likely to be Maori, early pastoral and surveying sites of interest as Lindis Pass was a recognised Maori route and there has been European occupation since 1858 (Omarama Run). The Trust requests that heritage values be thoroughly investigated through heritage research and a field survey, and that landowners are advised that ground disturbance affecting archaeological sites requires authority under the Historic Places Act 1993.

Canterbury Aoraki Conservation Board
The Board provided general comments on the desired outcomes of tenure review. The Board requests that:

- ecological connectivity with adjacent protected areas be maintained;
- altitudinal sequences be protected;
- freshwater systems be protected and buffered (fenced) from the effects of activities on adjacent land;
- boundaries with freehold land be fenced and include buffers to protect ecological values from the effects of activities on adjacent land;
- opportunities for recreational access be provided (e.g. mountain bike tracks);
- land use capability be taken into consideration;
- Ngai Tahu values be respected and protected;
- any covenants on freeholded land be effective.

Forest and Bird Society – Dunedin Branch

- All land above 1000m to be restored to full public ownership as conservation land.
- Restore Manuka Creek catchment above 700m to full public ownership as conservation land.
- Protect low altitude shrublands by way of covenant.
- Protect low altitude outwash plan in north west corner of property as covenant or scientific reserve.
- Seek public 4WD access adjacent to Manuka creek to foot of Wether Range.

3.2 DISTRICT PLANS

The property lies within the Waitaki District. The proposed Waitaki District Plan was publicly notified in December 1996. Following public submissions and hearings on the proposed plan, the District Plan as amended by Council decisions was released in September 1999.

The entire property is zoned Rural Scenic (Rural S). With the exception of the MacKenzie Basin floor the property is subject to an additonal overlaying zone of Oustanding Natural Landscape (ONL). The Rural Scenic Zone contains areas of the District which have significant scenic values – the high country, rangelands and inland basin areas. The majority of this zone lies above the 400 m contour (a.s.l). ONL areas comprise landscapes that "are outstanding due to their high degree of unity, coherence and naturalness."

The Plan establishes what sort of activities are Permitted, Controlled, Discretionary or Non-complying. The Plan also establishes Site Development Standards and Critical Zone Standards for these activities. A permitted or controlled activity that does not comply with any one or more of the Site Development Standards becomes a restricted discretionary activity. However, the Plan has undergone a number of changes in the Rural Scenic Zone following Council's decisions on submissions.

Rules of particular relevance to the property include:

- No exotic tree planting, including amenity tree planting, shall be allowed above 900m or in an ONL (with the exception fo amenity planting).
- Exotic Trees of the following species shall not be established in the Rural Scenic Zone:

  a) Lodgepole pine *Pinus contorta*
  b) Scots pine *Pinus sylvestris*
  c) Corsican pine *Pinus nigra*
  d) Dwarf mountain pine *Pinus uncinata*
  e) Mountain pine *Pinus mugo*
  f) Douglas fir *Pseudotsuga menziesii*
  g) All larches *Larix* species
  h) All alders *Alnus* species
  i) All willows *Salix* species
  j) Sycamore *Acer pseudoplatanus*

- Tight controls on the removal of indigenous vegetation except for those areas freeholded under the CPLA (1998).
- Irrigation and cropping are non complying activities within the ONL zone.
- Builidng is a prohibited activity within the ONL zone or above 900m
- Earthworks are a prohibited activity within the ONL zone or above 900m except for the maintenance of exisiting tracks.

3.4 CONSERVATION MANAGEMENT STRATEGIES

Twin Peaks Pastoral Lease lies within the Waitaki Place Unit of the Canterbury Conservancy. Relevant priority objectives for this unit listed in the CMS (Department of Conservation, 2000) are:

- To identify, maintain and seek to enhance the natural landscapes and natural landscape values of the Waitaki Unit.
- To identify the significant indigenous vegetation and threatened species of the Waitaki Unit.
- To use a range of effective methods to protect the indigenous biodiversity of the Waitaki Unit.
- To protect and enhance the viability of priority threatened species populations and their habitat(s) in the Waitaki Unit.
- To improve the range of viable riparian habitats for indigenous species in the Mackenzie Basin.
- To prevent the loss of natural and landscape values from wilding trees on land managed by the Department.
- To liaise with land managers and regulatory agencies to control and contain wilding trees.
- To reduce and maintain rabbit and thar densities to levels that ensure their adverse effects on natural values are minimised.
- To provide new recreational facilities and opportunities by the Department and other organisations and concessionaires where natural and historic values are not compromised.
- To liaise with adjacent landholders to resolve conflicts over access for recreation to land managed by the Department.
- To provide quality interpretation at priority sites in the Mackenzie Basin.
- To increase public awareness of the natural and historic values of the Waitaki.

3.4 NEW ZEALAND BIODIVERSITY STRATEGY

The New Zealand Government is a signatory to the Convention on Biological Diversity. In February 2000, Government released the New Zealand Biodiversity Strategy. This strategy is a blueprint for managing the country's diversity of species and habitats. It sets a number of goals to achieve this aim. Of particular relevance to tenure review is Goal 3, which states:

- *Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified systems in production and urban environments, and do what is necessary to:*
- *Maintain and restore viable populations of all indigenous species across their natural range and maintain their genetic diversity.*

PART 4 ATTACHMENTS

4.1 ADDITIONAL INFORMATION

4.1.1 Scientific Names of Animal Species

Native and endemic birds

banded dotterel	*Charadrius bicinctus bicinctus*
bittern	*Botaurus poiciloptilus*
black-billed gull	*Larus bulleri*
black-fronted tern	*Chlidonias albostriatus*
black shag	*Phalacrocorax carbo novaehollandiae*
black stilt	*Himantopus novaezelandiae*
grey warbler	*Gerygone igata*
New Zealand pied oystercatcher	*Haematopus finschi*
New Zealand pipit	*Anthus novaeseelandiae novaeseelandiae*
paradise shelduck	*Tadorna variegata*
pied stilt	*Himantopus himantopus leucocephalus*
silvereye	*Zosterops lateralis lateralis*
Southern black-backed gull	*Larus dominicanus dominicanus*
spur-winged plover	*Vanellus miles novaehollandiae*
swamp harrier	*Circus approximans*
white-faced heron	*Ardea novaehollandiae*
wrybill	*Anarhynchus frontalis*

Introduced and naturalized birds

Australian magpie	*Gymnorhina tibicen*
blackbird	*Turdus merula*
chaffinch	*Fringilla coelebs*
chukor	*Alectoris chukar*
dunnock	*Prunella modularis*
goldfinch	*Carduelis carduelis*
greenfinch	*Carduelis chloris*
house sparrow	*Passer domesticus*
mallard	*Anas platyrhynchos*
quail	*Callipepla californica brunnescens*
redpoll	*Carduelis flammea*
skylark	*Alauda arvensis*
song thrush	*Turdus philomelos*
starling	*Sturnus vulgaris*
yellowhammer	*Emberiza citrinella*

Reptiles

common skink	*Oligosoma polychroma*
grand skink	*Oligosoma grande*
green skink	*Oligosoma chloronoton*
jewelled gecko	*Naultinus gemmeus*
McCann's skink	*Oligosoma maccanni*
Otago skink	*Oligosoma otagense*
scree skink	*Oligosoma waimatense*
Southern Alps gecko	*Hoplodactylus* aff. *maculatus* 'Southern Alps'
spotted skink 'Mackenzie Basin'*	*Oligosoma* aff. *lineoocellatum* 'Mackenzie Basin'

Fish

brown trout	*Salmo trutta*
rainbow trout	*Oncorhynchus mykiss*

Introduced mammals

brown hare	*Lepus europaeus occidentalis*
brushtail possum	*Trichosurus vulpecula*
European hedgehog	*Erinaceus europaeus*
European rabbit	*Oryctolagus cuniculus cuniculus*
feral cat	*Felis catus*
feral ferret	*Mustela furo*
stoat	*Mustela erminea*
weasel	*Mustela nivalis vulgaris*

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4.2 Maps

Map 4.2.1 (a) **Topocadastral Map**

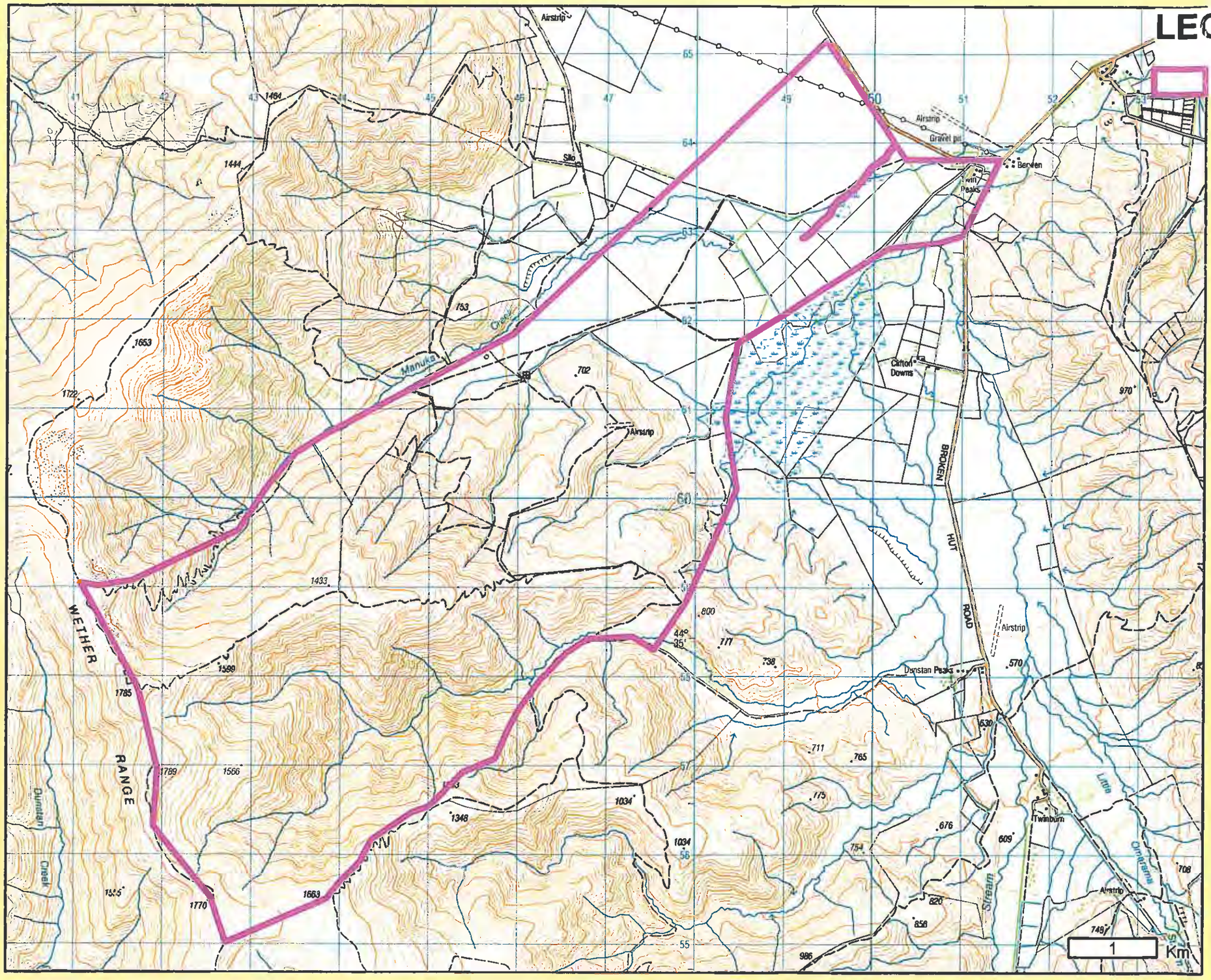
Map 4.2.1 (b) **Topocadastral Map – Strategic Context**

Map 4.2.2 **Landscape Units and Values**

Map 4.2.3 **LENZ Environments and Threat Status**

Map 4.2.4 **Landuse Capablity**

Map 4.2.5 **Natural and Recreational Values**



LEGEND

Twin Peaks Pastoral Lease

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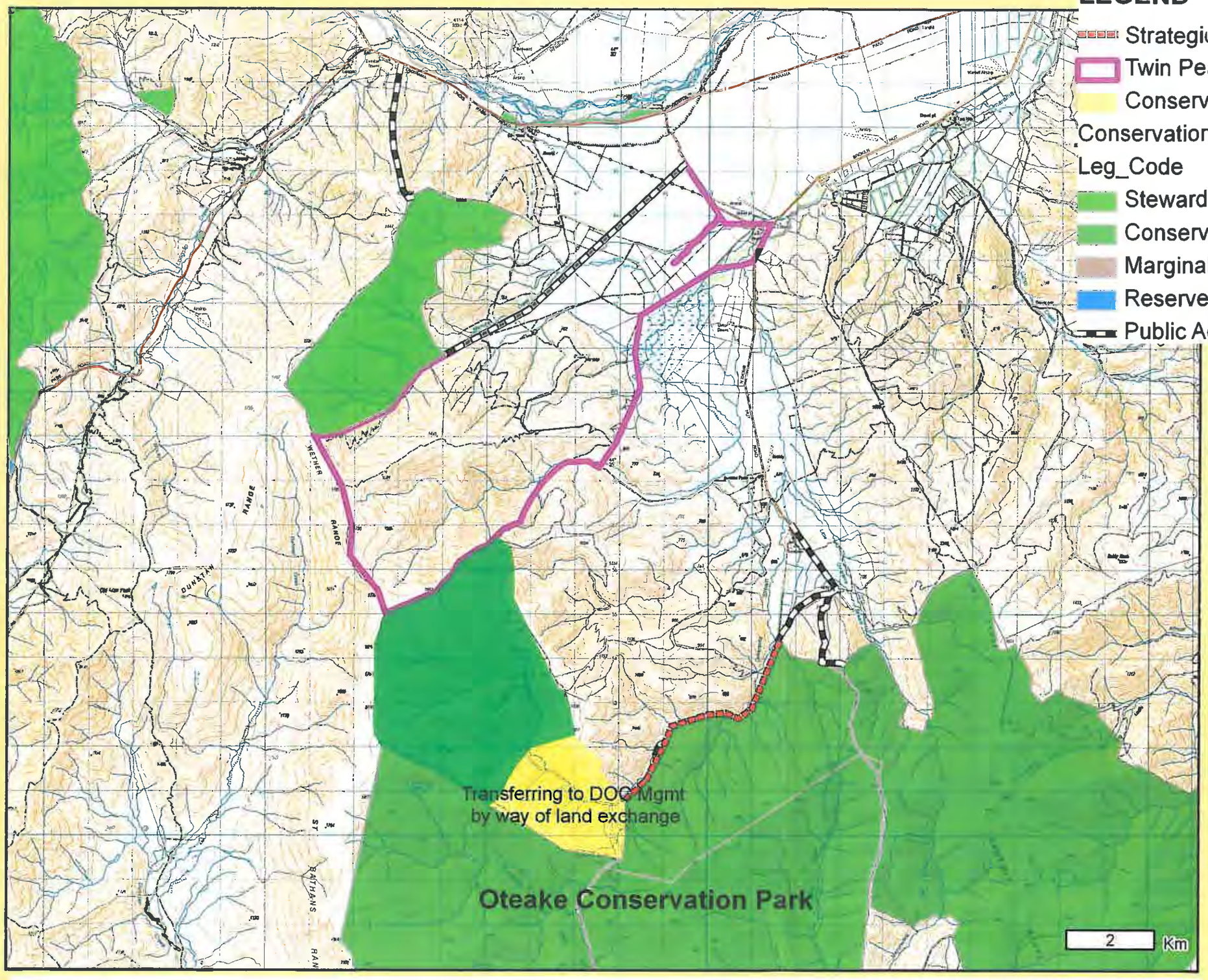
Map 4.2.1(a) Topo-cadastral



LEGEND

- Strategic Legal Road
- Twin Peaks Pastoral Lease
- Conservation Covenant

Conservation Units

Leg_Code

- Stewardship
- Conservation Park
- Marginal Strip
- Reserve
- Public Access Easement Over Private Land

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Map 4.2.1(b) Topo-cadastral Strategic Context

LEGEND

Twin Peaks Pastoral Lease

THREAT_CATEGORY

- At Risk
- Chronically Threatened
- Critically Underprotected
- No Threat Category
- Underprotected

N

1 Km

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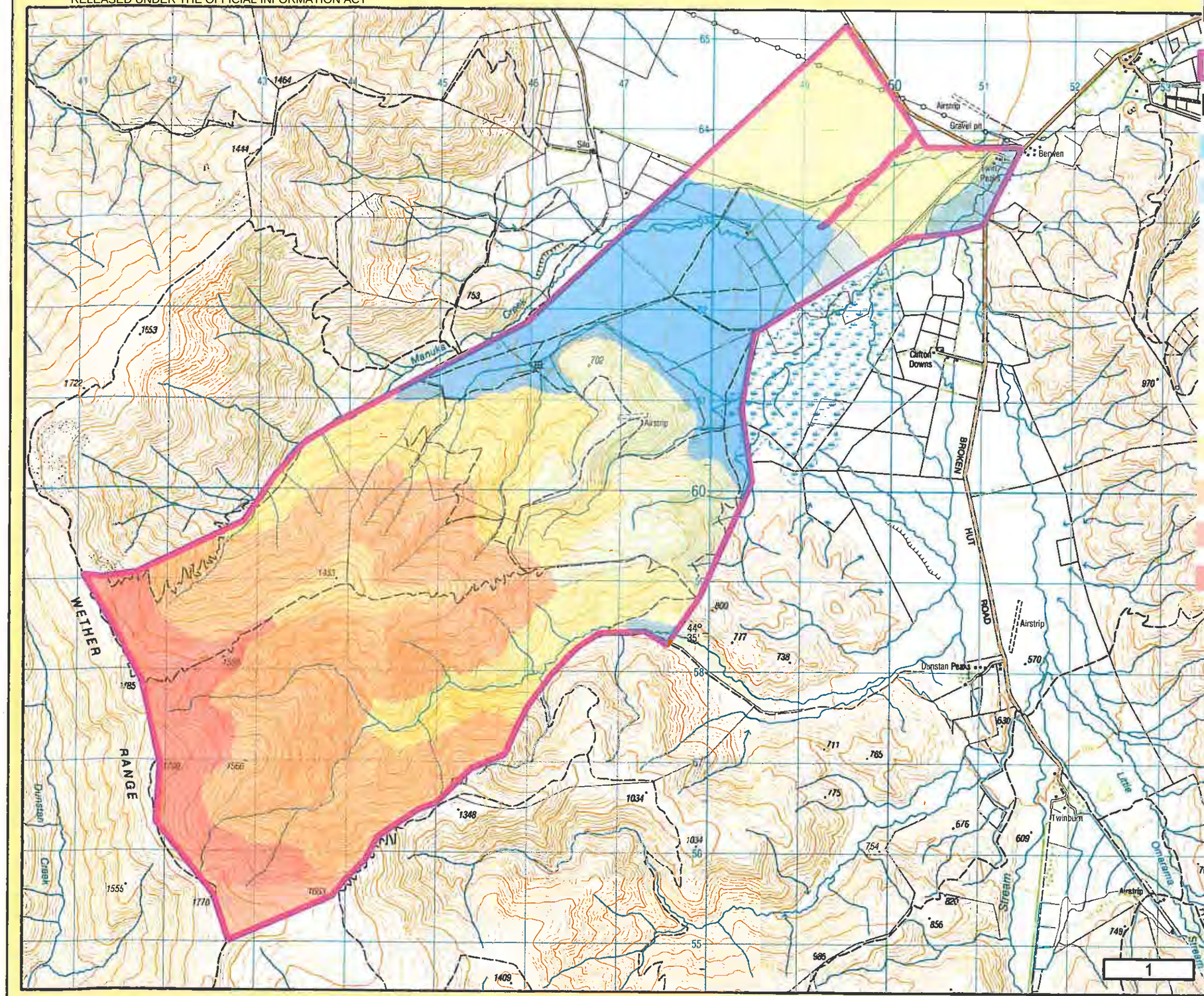
Map 4.2.3 LENZ Environments and Threat Status



LEGEND

Twin Peaks Pastoral Lease

LUC

- 4s 9
- 4s12
- 5w 2
- 6e19
- 6e22
- 6s 7
- 7e12
- 7e21
- 7e26
- 8e 6
- 8e 9

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Map 4.2.4 Landuse Capability

LEGEND

- Twin Peaks Pastoral Lease
- Area of Significant Botanical Values
- Lizard Records
- Threatened & at Risk Bird Records
- Route of Strategic Recreational Value

1 Km

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Map 4.2.5 Botanical Faunal & Recreational Values

4.3 Photographs

LANDSCAPE UNIT 1: OMARAMA BASIN FLATS

Photo 1: View southwest across flats from near the property boundary.

Photo 2: View north west across developed flats.

Photo 3: View north from lower slope of Wether Range (LU2). Undeveloped flats are contiguous with similar land beyond the boundary.

Photo 4: View north west. Killermont rising left and Diadem Range on right.

Photo 5: View west of farm buildings close to southern boundary. Wether Range portion of property directly behind.

LANDSCAPE UNIT 2: WETHER RANGE DISSECTED HILLS

Photo 6: Flats at base of Wether Range foothills. Sweet briar/matagouri and pasture are the main vegetation components.

Photo 7: Central spur between main tributaries of Manuka Creek to the north of the central spur and the unnamed tributary of Omarama Stream on left of the photo.

Photo 8: View of unnamed tributary of Omarama Stream. Boundary follows valley floor.

Photo 9: View down central spur. Unnamed tributary of Omarama Stream on right. Vegetation patterns highly modified.

Photo 10: View uphill from access track on central spur. Snow tussock is severely depleted left of fenceline and comprises mainly hawkweed and sorrel.

Photo 11: Very degraded mid-slope of central spur. (approx 1200m)

Photo 12: Severely depleted vegetation at 1200m.

Photo 13: View of lower hill slopes and flats. The yellow flower of hawkweed is conspicuous at the time of inspection

LANDSCAPE UNIT 3: WETHER RANGE UPPER SLOPES & SUMMIT

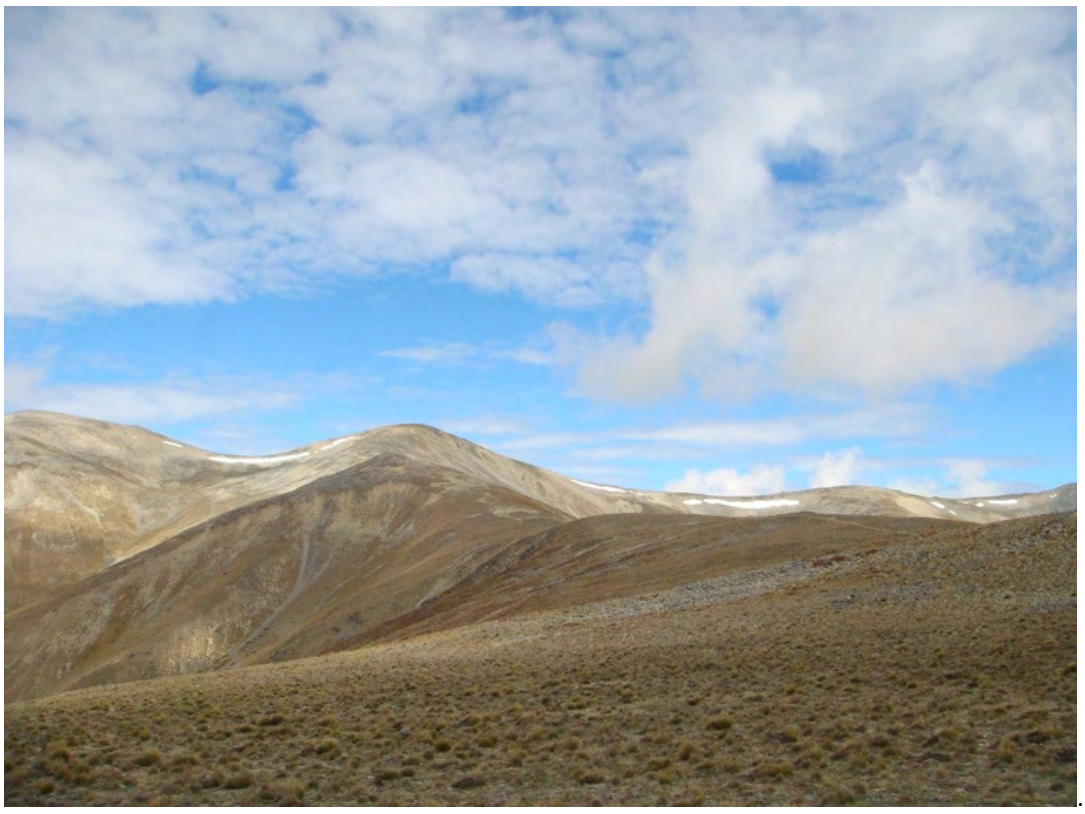

Photo 14: View of 'shoulder' spur and upper slopes and basins.

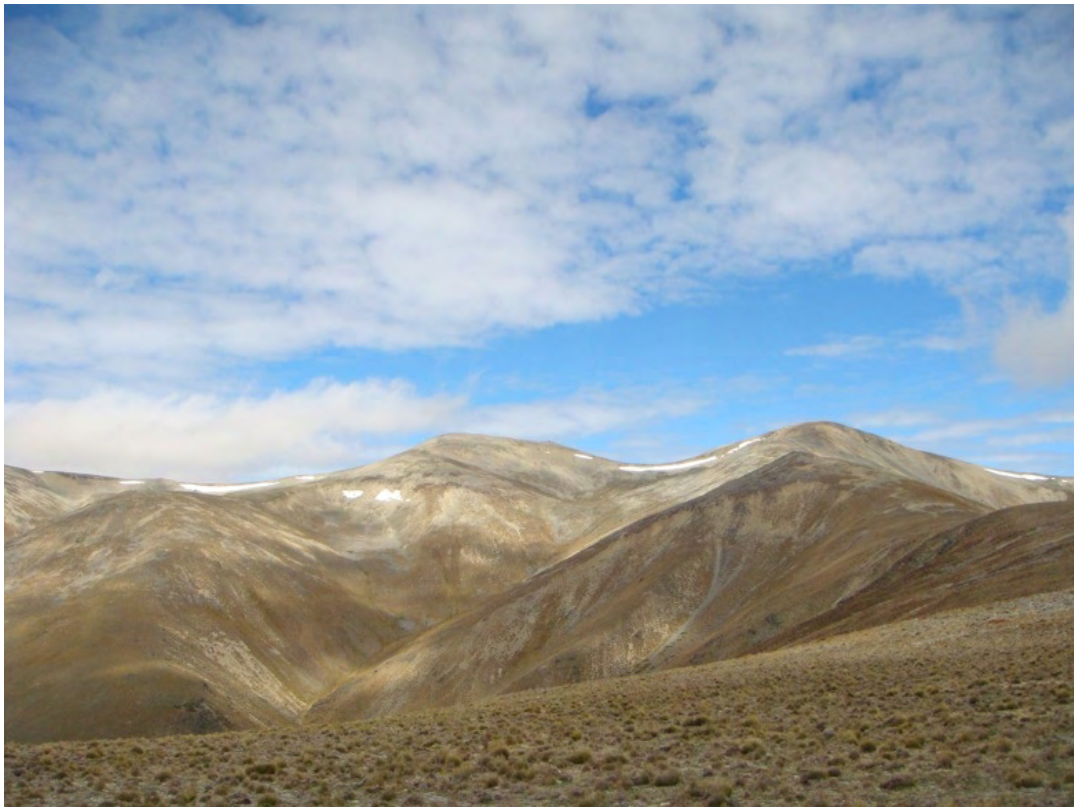

Photo 15: Upper slopes and basins. Natural character intact despite depleted and degraded vegetation.

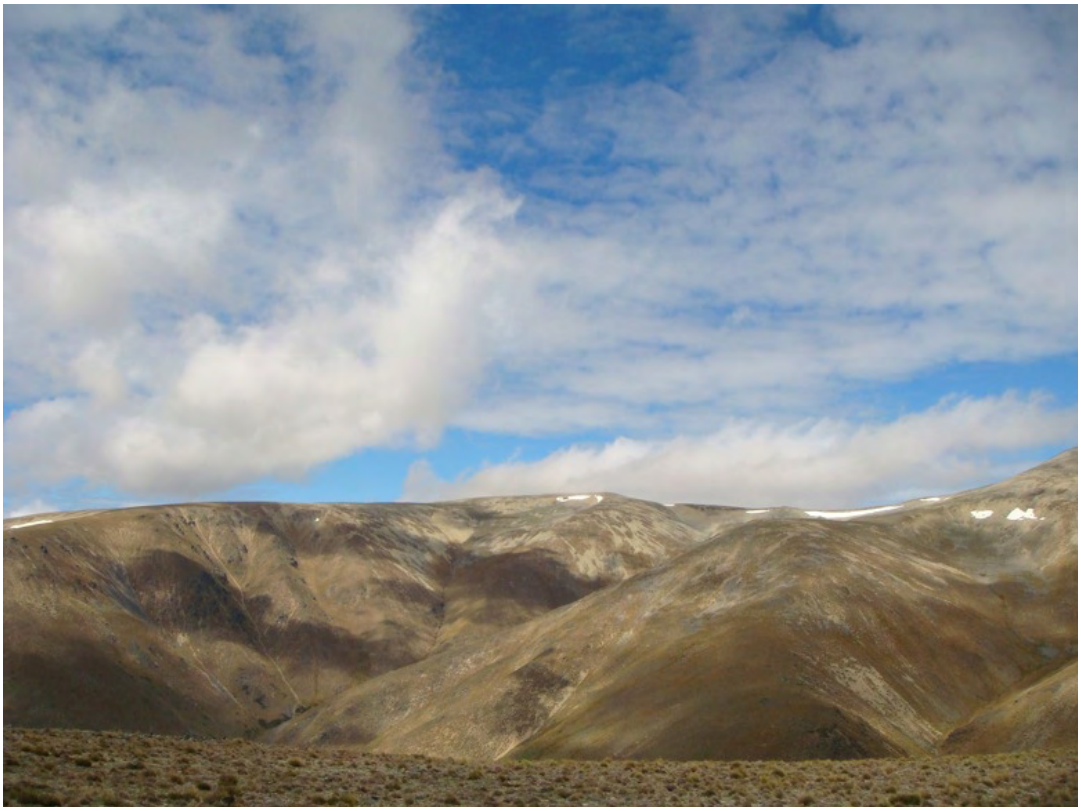

Photo 16: Upper slopes and basins.

Photo 17: View of south face in headwaters on unnamed tributary. Prostrate dracophyllum and tussock is the dominant vegetation. The recently formed track appears as a significant scar.

Photo 18: High level of natural character at this altitude below summit.

Photo 19: View south along Wether Range summit. Upper Dunstan Creek on right.

Photo 20: Central spur with Manuka Creek on left.

Photo 21: View north west along Wether Range near boundary with Killermont Conservation Area.