

## **Crown Pastoral Land Tenure Review**

**Lease name :Kawarau Station**

**Lease number :PO 234**

### **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.

The report attached is released under the Official Information Act 1982.

**Copied October 2002**

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**DEPARTMENT OF CONSERVATION  
REPORT ON TENURE REVIEW OF  
KAWARAU PASTORAL LEASE  
UNDER PART 2  
CROWN PASTORAL LAND ACT**

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## PART 1

### 1.1 INTRODUCTION

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The lessee of Kawarau Pastoral Lease has applied to the Commissioner of Crown Lands for a review of tenure. The property was inspected in November 1998 by Department of Conservation staff. The property had been assessed for some of its conservation values previously, during the Protected Natural Areas Programme Survey (PNAP) of the Old Man Ecological District in 1984/85.

The PNAP survey identified two second priority recommended areas for protection (RAPs) on the property, namely part RAP Old Man 2/1 Slapjack Creek and part RAP Old Man 2/2 Potters Creek.

Kawarau Pastoral Lease is a medium sized property of 4814 ha. The homestead is located on Bannockburn road, 12 km from Cromwell. The pastoral lease extends from Bannock Burn to the Nevis river and includes part of the crest of the Carrick Range. It is run in conjunction with Mt Difficulty Pastoral Lease, which has previously been reported on by DOC for tenure review.

Both properties are to undergo tenure review concurrently.

## PART 2

### INHERENT VALUES : DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

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#### 2.1 LANDSCAPE

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##### METHODOLOGY

For this assessment Kawarau has been divided into three landscape units. The boundaries were defined principally by differences in slope, aspect, altitude, and pastoral production. After defining the landscape units (LUs) the following landscape criteria were applied to determine each unit's distinctive and high inherent values.

1. **Character description:** This section of the assessment explains the overall appearance of the LU using common descriptive terms to help create a "mental picture" of the primary elements which include landform, landcover, and where appropriate, land-use.
2. **Quality attributes:** The following are the attributes which contribute to the overall quality of each landscape unit:
  - (a) *Intactness:* Which is the condition of the natural vegetation and the degree of modifications to natural processes. In a landscape context intactness can be looked upon within a continuum from completely pristine to heavily modified.
  - (b) *Coherence:* This is the level of harmony visually evident between natural elements, or the way a landscape "hangs together".
  - (c) *Distinctiveness:* This is the special elusive quality which makes a particular landscape visually striking. Frequently this occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern.
3. **Vulnerability:** This is a measure of each landscape unit's susceptibility to further ecological deterioration. It is based primarily on the intactness and coherence attributes. In general terms the less modified a LU is, the more vulnerable it is to further change as a result of human activities.

##### PHYSICAL SETTING

Kawarau pastoral lease is located along the northern side of the Old Man Ecological District and forms a major physical component of the Carrick Range. These low rangelands, along with the adjoining Cairnmuir Mountains, form the front edge to an extensive block mountain landscape which is dominated by the Old Man Range, Garvie Mountains, and Old Woman Range.

The Carrick Range is covered predominately in short tussock grasslands. While snow tussock is widespread, its pattern is determined by aspect, moisture, and fire history. The native grasslands fade out in the low country where exotic pasture and a mixture of shrublands become the dominant ground cover. More intensive farmland around the homestead was not assessed.

##### Landscape Unit 1

This unit encompasses all the north-east facing slopes that overlook the Bannockburn Valley. The unit has three main physical components. The parallel Smiths and Pipeclay gullies stem

from shallow basins which lie just below the ridgeline that separates these catchments from Potters Creek which flows in the opposite direction. Mt Difficulty (800m) is markedly different to the rest of the Carrick Range, being dissected by a series of steep gullies and having a relatively sharp ridgeline which forms the physical setting to much of the Bannockburn valley.

The vegetation is predominately introduced grasslands which extend from the low country to the main crest. The visual effect of AOSTD is particularly pronounced during spring months. On the shady sides of the main and side gullies native shrubland remnants persist usually on and around rocky outcrops. Large expanses of sweet briar occupy the sunny slopes of the gullies while on the low drier ridges thyme is a common ground cover. Lombardy poplars along the edges of water courses often signal the sites occupied by early miners.

The extent of historic features include water-races, outlines of stone cottages, sluiced faces, and vertical shafts; unfortunately in a landscape context, the significance of these historic sites has been reduced due to the changes to their physical setting. Much of the character of the historic period in the 1860's has been lost due to farming intensification and the close proximity of some tracking which in some places encroaches within the historic sites. The natural character of the unit has been extensively changed with only fragments of the original landscape still remaining.

### Landscape Unit 2

This unit encompasses the whole of the rolling uplands which tilt gently towards the south-west corner of the property. The altitudinal range of these expansive uplands varies between 1200-1300m asl.

The drainage pattern is confined to two main streams. Potters Creek drains into the Nevis River just south of the property and a similar sized water course (unnamed) flows into the Nevis Gorge. The physical characteristics of the two catchments are similar with both head catchment areas comprising shallow basins surrounded by diverging depressions. The source of these water courses is from either finger bogs or extensive wet flushes which feature a mosaic of turf species. In both catchments small water courses combine to form a single channel which then meanders across the basin floor. The mid section of these streams becomes more confined with rocky outcrops being prominent. The final sections are contained within gorges where the water tumbles across a series of white water rapids before flowing into the Nevis.

The landform within this unit has a very subdued topography. Slight changes in relief create a subtle landscape where the differences between rounded ridgelines is determined by individuality of the rocky outcrops which protrude above the skyline. The most impressive row of rocky outcrops and tors are on the crest of a ridge which bounds the Nevis river faces.

As with landform, groundcover across these uplands is subtle with irregular patterns formed when tussockland communities merge in to create a cohesive landscape. It would appear the distribution of tussock communities is dictated by aspect, altitude, and possibly burning history. However there would appear to be a trend for a gradual change from fescue tussock being the dominant species on the sunny faces within the Potters Creek catchment to becoming co-dominant with snow tussock in the south-west corner of the property.

As with the tussock sward there appear to be marked differences between the two main catchments on the geographic range of introduced species. Potters Creek supports a relatively high content of introduced grasses, *Hieracium* species, and sheep sorrel, while in the unnamed southern catchment introduced grasses fade away markedly.

The "built" elements contained within this unit comprise a network of tracks which are only a minimal visual element as they follow natural contours. The subdivisional fencing is also minimal as the property is managed under an extensive regime.

In visual terms this unit conveys a strong impression of uniformity with the simplicity of the various grassland communities being overlaid on a subdued landform, which combines to form a distinctive high country landscape that has muted visual qualities. Furthermore the overall intactness of the landscape patterns and ecological processes combine to make this unit a significant natural landscape. This unit includes the upper section of the RAP.OM2/2.

The unit's main threats to change include:

- Further subdivision would affect the existing subtle vegetation pattern.
- Further tracking or "built" elements would compromise the back country and semi-wilderness qualities of this unit.
- Further depletion to the tussock sward through increased grazing pressure.

#### **Landscape Unit 2(A)**

This area is a sub-unit of LU2 and comprises the headwaters of Long Gully Creek which flows into the Kawarau close to Bannockburn. This unit's main physical feature is the narrow ridgeline separating Potters Creek from Long Gully. This ridgeline has wind and frost erosion. The thin yellow-brown soils in many places have been removed leaving a pavement of small rock fragments.

The vegetation is dominated by modified short tussock grasslands with a sparse scattering of snow tussock. Grey shrublands occupy the darker faces.

Although this sub-unit does not have any distinctive landscape/visual values, it is a part of the uplands and therefore should be managed in a complementary manner. Further limitations could be placed on this sub-LU for soil and water conservation purposes.

#### **Landscape Unit 3**

This unit comprises steep faces above the Nevis River Gorge. Altitude ranges from 1327 m (Trig T) down to 550 m along the margins of the river.

This unit contains a diversity in physical features which include a rounded ridgeline studded with craggy tors. The mid section features surface slumping and outcrops of parent rock and fractured surface rock. At about the 750m contour there is a relatively well defined drop off into the Nevis River Gorge. At this point the river takes on wild and scenic qualities with in-stream elements such as white water rapids.

The distribution of vegetation follows the changes in physical character. At higher altitudes, snow tussock and clumps of short tussock form a sparse cover. At mid altitudes there is a band of short tussock interspersed with introduced grasses and some small mats of *Hieracium*. The lower slopes are clad in mixed native shrublands with the upper edges comprising native broom and matagouri which grade into *Olearia* shrublands which continue down to the river's edge.

The "built" elements include one track leading down a spur to an old musterers' hut.

In visual/landscape terms this unit contrasts sharply with the adjoining LU2, primarily because of major differences in vegetation patterns, steepness of slope, and rocky outcrops. Furthermore it forms the setting to the Nevis River which at this point conveys strong wild and scenic characteristics. Its lack of "built" elements and minimal sub-divisional fencing strengthens its overall sense of remoteness. It should be noted that this unit includes the upper sections of Slapjack Creek which has already been identified as an RAP for its scientific value; however from a landscape perspective this tributary to the Nevis is not as distinctive as the more southern faces overlooking the river.



## SIGNIFICANCE OF THE LANDSCAPE

In a landscape context the Kawarau Pastoral Lease contains a wealth of natural and cultural features including historic mining sites, "finely grained" tussock lands, and a spectacular rugged gorge.

The property has high inherent landscape values which have been retained by an early recognition of the grazing limitations of this fragile semi-arid country. What epitomises the special character of this lease is the homogenous landform and cover within LU 2 which gives the landscape with a sense of spaciousness. LU 3 is the setting of the Nevis river and conveys strong wild and scenic characteristics, with an overall sense of remoteness. It includes the upper part of Slapjack Creek.

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## 2.2 LANDFORM AND GEOLOGY

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The property varies in altitude from 305 m to 1310 m asl.

### Geology

Basement rock in the Old Man Ecological District is comprised of block faulted terrain of the Haast Schist Group, metamorphosed to textural zone IV in the north of the Ecological District, which includes Mt Difficulty, at the end of the Carrick Range. This range is a westward tilted block reduced by the landsliding along the Kawarau and Nevis Valleys.

### Topography

The Carrick Range is a block mountain landscape typical of the Ecological District, trending north-south. The present drainage system has been partially superimposed into this topography, chiefly along linear structural weaknesses, eg, faults and joints. Deep antecedent gorges occur along the Nevis and Kawarau Rivers - typically asymmetric (steep resistant derivative slopes opposing extensively slumped slopes).

### Soils

Yellow grey silty-sandy loams dominate the sides of the Carrick Range. These soils occupy the lower hills, valleys and basins up to 900 m.

Soils are chiefly derived from schist, liess and alluvium. Main soil types include the following:

Carrick Hill, Conroy Hill and Blackstone Hill soils with moderate fertility. Steepland soils include Alexandra brown grey earth on lower slopes, Dunstan and Arrow are upland and high country yellow brown earths. The soil types have moderate fertility but are drought prone. They are poorly weathered soils with shallow profiles and weakly developed structure. Dunstan steepland soils are of low natural fertility. These are very friable and prone to sheet erosion when vegetation is burnt or intensively grazed. Water conservation is the prime use of this soil type.

### Landforms of RAPs

#### *1 RAP OM 2/1, Slapjack Creek*

A deeply incised re-entrant catchment draining the western slopes of the Carrick Range above the Nevis-Kawarau River's confluence. Extensive mass movement topography is present over the catchment, formed through rapid fluvial down cutting and faulting.

The southern and eastern slopes are ripply, slump features of small and large dimensions occurring throughout, and a large earthflow is located at the catchment head. Rubbly landslide debris mantles the western flanks. Northern slopes have complex slumping in three large features: eastern ripply topography; mid catchment gravity faulting (five faults) and rubbly

blockslumping/landsliding with mass movement caverns, large boulders and slump terracing to the west.

The main channel is deeply entrenched into the landscape and north-east trending, probably following a fault that has produced a bluffy scarp and alluvial backup in the gully below Slapjack Saddle.

Steep gorgy derivative flanks occur in the lower catchment.

A descending altitudinal sequence of yellow-brown (Carrick, Dunstan) and yellow-grey (Arrow) hill/steepland soils. These are locally sheet and gully eroded on sunny steep aspects.

*# RAP OM 2/2, Potters Creek*

This is a lightly and regularly incised landscape with vestiges of an old westward sloping plateau.

The catchment head is low with a high reaching main gully and alluvial depressions near the northern drainage divide - indicative of progressive capture by steep northern catchments. Rounded tor-studded ridges flank the catchment on the northwest, east and south.

Mid-catchment areas have two moderately deep valleys with wide alluvial floors and a steep reduced interfluvium. Isolated slump features occur amongst the regular colluvial slopes.

The lower catchment is steep and gorgy with flanking bluffs, buttresses, steep colluvial slopes, slumps, extensive rubble/scree, and a steep main stream.

A descending altitudinal sequence of yellow-brown (Carrick, Dunstan) and yellow-grey (Arrow) hill/steepland soils. These are locally sheet eroded on steep and exposed localities.

This catchment is representative of the older structural landscape of the southwestern Carrick Range as a remnant of the original block faulted/tilted terrain. It is more deeply incised than adjoining catchments due to the deepened base level of the lower Nevis Gorge.

It is a less spectacular example of the old structural landscape as it has lost the continuity between the structural basin and sloping plateau through fluvial erosion during down-cutting formation of the gorge. The upper catchment contains a typical tor landscape, and it has a steep rocky lower catchment.

The state of capture of the captive head by active deep northern catchments, ie, Long Gully and Pipeclay Gully is important in terms of a typical contrast between old and young landscapes at the catchment head.

There are no Geopreservation Inventory sites located on the property.

#### SIGNIFICANCE OF THE LANDFORMS

RAP OM 2/1 landform features are typical of the Carrick Range with dramatic mass movement topography over much of the Slapjack Creek catchment and derivative slopes cover the lower reached.

RAP OM 2/2 landform features are representative of the sloping plateau landscape. A notable feature is the prominent tor landscape.

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## 2.3 CLIMATE

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The inland rain shadow location of the ecological district is reflected in the continental climate of the Carrick Range. Annual precipitation is between 300-800 mm with much falling as snow. The property spans relatively low altitude and snow-lie is usually of short duration. The climate displays strong semi-arid characteristics. Clear blue skies with a high incidence of frosts are typical features. Winters have severe frosts and summers are hot and dry and subject to north west winds. High wind speed events are frequent events in exposed parts of the property.

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## 2.4 VEGETATION

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### 2.4.1 DESCRIPTION

A logical division exists between areas of the property which lie west of the Carrick Range towards the Nevis River, and areas which lie east of the Range with catchments feeding directly into the Kawarau River near Bannockburn.

#### **Eastern Carrick Range**

This includes the active deep catchments of Pipeclay Gully, Smiths Gully, headwaters of Long Gully, mid-section of Adams Gully, and low hills between Shepherds Creek and Bannock Burn.

Introduced pasture grasses and weeds dominate with a scattering of silver and hard tussock. Remnants of taller *Chionochloa rigida* grasslands occur in the upper reaches of Pipeclay Gully and Smiths Gully. Bare ground resulting from sheet erosion is prevalent in the headwaters of Long gully.

Shrublands are scattered throughout and form locally dense "ribbons" along streams and associated steeper slopes. These are dominated by briar and to a lesser degree matagouri, with occasional *Olearia odorata* and *O. bullata*. At higher altitudes matagouri dominates and *Aciphylla aurea* become more common.

At lower altitude dry sunny slopes are often dominated by mats of *Raoulia australis* and thyme.

#### **Western Carrick Range**

This include tributaries of the Nevis River, in particular the headwaters of Potters Creek, a large creek and several smaller un-named creeks to the north, and the headwaters of Slapjack Creek.

#### **Potters Creek and un-named creek to north**

The headwaters of Potters Creek comprise part RAP Old Man 2/2. This is a more subdued landscape than the rest of the property with vestiges of the older block faulted terrain. The gentle basin is dominated by hard tussock but dense stands of snow tussock occur in the higher altitude feeder gullies. Common inter-tussock species include *Poa colensoi*, *Ranunculus multiscapus*, *Oreomyrrhis* spp, *Kelleria* spp, *Carmichaelia vexillata*, *Pimelea oreophila*, *Leucopogon fraseri*, *Stellaria gracilentia* and *Raoulia subsericea*. Mouse-ear hawkweed is present in generally small localised patches.

Excellent examples of sub-alpine finger bogs extend alongside the stream channels. These have been little impacted by stock and are very diverse. The very wettest areas are dominated by various moss and liverwort species. Elsewhere common species include *Plantago triandra*, *Geum leiospermum*, *Gaultheria parvula*, *Leptinella squalida*, *Cardamine debilis*, *Epilobium komarovianum*, *Neopaxia linearifolia*, *Ourisia caespitosa*, *O. glandulosa* and *Celmisia gracilentia*. The comb sedge *Oreobolus pectinatus* forms small discrete cushions.

The same pattern of bogs and short tussock grassland with snow tussock at highest elevations also occurs in the un-named catchment immediately north of Potters Creek. Unlike Potters Creek, this tributary of the Nevis River is entirely within Kawarau Pastoral Lease and ranges in altitude from 540 m at its confluence with the Nevis river, to approximately 1300 m at the crest of the Carrick Range.

The middle reaches of this catchment have impressive steep north-west facing rock crags with *Helichrysum intermedium* and shrublands of *Olearia odorata*, *O. bullata* and *Carmichaelia petriei* at their base. South-facing rock bluffs support *Celmisia brevifolia* and *Anisotome caudicola*. Occasional shrubs of *Dracophyllum prunum* and *Carmichaelia crassicaule* occur amongst areas of snow tussock further up-slope.

Rounded tor-studded ridges flank both of the above catchments. The tors support a distinctive vegetation including *Myrsine nummularia*, *Helichrysum intermedium*, *Ozothamnus vauvillierii*, *Coprosma* sp, *Leucopogon fraseri*, *Brachyglottis haastii*, *Blechnum pennamarina*, *Schizeilema haastii* and *Asplenium terrestre*.

#### *Nevis faces*

Steep dry hill slopes above the Nevis River form the western boundary of the property. These consist of depleted snow and short tussock at higher elevations and short tussocklands at lower elevations. Below the ridge crest there is much bare ground with scattered shrubs of *Carmichaelia petriei*, *C. vexillata*, *Meliclytus alpinus* and *Leucopogon suaveolens* and the speargrass *Aciphylla aurea*. *Hieracium lepidulum* is a frequent herb in disturbed ground.

Below 900 m in the larger creeks are several areas of dense shrublands comprised predominantly of matagouri, *Olearia odorata*, *Coprosma propinqua* and briar.

#### *Slapjack Creek*

The headwaters of Slapjack Creek are part of RAP Old Man 2/1. In contrast to other catchments on the property it exhibits a distinctive array of slump features including a large earthflow at the catchment head.

Tall snow tussock is restricted to slopes above approximately 1100 metres. Hard tussock dominates elsewhere with pockets of silver tussock on damper south-facing slopes. Introduced pasture grasses and weeds dominate between tussocks.

Open matagouri - *Coprosma propinqua* shrublands dominate the central valley slopes and with *Olearia odorata*, *Carmichaelia petriei*, *Rubus schmidelioides* var. *subpauperatus* and briar form very dense shrublands along the main stream channel. Introduced elder, *Sambucus nigra*, is a significant component of the shrublands in the lower catchment.

Small rock outcrops on west facing slopes adjoining Slapjack Creek Conservation Area support a range of palatable native herbs including *Anisotome caudicola*. Two threatened shrubs, *Pimelea aridula* and *Carmichaelia compacta* are locally common here along with *Vittadinia australis* and *Aciphylla aurea*. Thyme is prevalent in open dry sites at lowest elevations.

#### 2.4.2 PROBLEM PLANTS

Briar is a major weed problem especially on the lower eastern faces of the Carrick Range, forming impenetrable thickets in damp gullies. *Hieracium pilosella* is present as small localised patches in the Upper Potters catchment and *H. lepidulum* occurs on the Nevis faces on disturbed ground. Neither species is considered a threat at current levels to indigenous plant values.

#### SIGNIFICANCE OF THE VEGETATION

The headwaters of Slapjack Creek (part RAP) contain *Chionochloa rigida* tussocklands at highest altitudes with short tussock over the remainder of the Carrick Range.

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Introduced grasses dominate the tussock understorey. Dense matagouri - *Coprosma* - *Olearia* - *Carmichaelia* shrublands flank the main stream channel. The two threatened shrubs *Pimelea aridula* and *Carmichaelia compacta* are locally common in the north-eastern corner of the catchment.

*P. aridula* is a category I (indeterminate) threatened species (Molloy and Davis 1994). *C. compacta* reaches its southern limit in the Old Man Ecological District and there are few records in the district.

The headwaters of Potters Creek (part RAP) and an un-named catchment immediately to the north are comprised of predominantly typical indigenous vegetation. Substantial remnants of tall *Chionochloa rigida* tussocklands are present at highest elevations. Elsewhere hard and silver tussock dominates with a varied and mostly indigenous understorey. Excellent examples of diverse sub-alpine finger bogs are present. Tor studded ridges and other rock bluffs are present with distinctive native vegetation communities.

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## 2.5 FAUNA

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### 2.5.1 INVERTEBRATE FAUNA

Brian Patrick, an entomologist with the Otago Museum has made the following records based on inspections undertaken in 1982 and 1990. Sampling occurred in grassland, wetland, riparian and schist tor communities.

The following species of native insect were found on this property, associated with the described communities. Significance is noted where appropriate.

#### *Orthoptera* (grasshoppers, wetas, crickets)

Two species of grasshopper, *Sigaus australis* and *S. campestris* were found commonly in the unimproved grasslands up to 1300 m. Both species are common and widespread in southern and eastern South Island, but more numerous in less modified grasslands. One large ground weta *Hemitantrus focalis* was found sporadically in the summit grasslands over 1260 m. The species is widespread in Otago mountains.

#### *Hemiptera* (bugs, cicadas)

The common grassland cicada *Kikibia angusta* is extremely numerous above 800 m from mid summer onwards. A small bug, *Nysius buttoni* is common in open areas amongst tussocks from 700-1200 m. Another lygaeid bug *Hudsona anceps* is similarly common over low herbs, but occurs from 1150-1300 m. Both species are characteristic of Central Otago alpine areas.

#### *Coleoptera* (beetles)

Amongst the largest and most spectacular insect recorded from this property is the locally threatened carabid beetle *Mecodema chiltoni*. With adults up to 4 cm in length, this flightless species can be found wandering about in the summit grassland or buried within deep tunnels under rocks during the day. The species was found to be uncommon on both this property and surrounding parts of the Carrick Range in the early 1980s, but was not recorded in 1990. Other carabids present are the widespread *Oregus aereus* and *Megadromus sandageri*.

The bright green chafer *Pyronota festiva* was common in low alpine grasslands along with a small chrysomelid beetle.

#### *Lepidoptera* (butterflies and moths)

A total of 37 species of native moths and butterflies were found on this property. Most are typical of such low alpine undeveloped grasslands in Central Otago, and include species such as *Orocrambus crenaeus*, *Scoparia deltophora*, *Asaphodes clarata*, *Aoponotoreas insignis*, *Aletia obsecrata*, *Ichneutica ceraunias* and *Graphania nullifera*.

One rare species is found on this property and generally on the Carrick Range, but in few other localities. At present it is confined to the mountains of Central Otago. It is an undescribed species of diurnal moth in the genus *Dichromodes*. The cryptic larvae have been found feeding on crustose black lichens on the taller schist tors. Three conspicuous species of brightly coloured geometrid moths have been found here too. All three, *Notoreas* new species, *Paranotoreas brephosata* and *Dasyuris anceps* are widespread and dependent on rich inter-tussock herbfield. The common tussock butterfly *Argyrophenga antipodum*, whose larvae feed on *Chionochloa* is common on this property up to 1300 m.

#### *Trichoptera (caddis)*

Five species of caddis, with aquatic larvae have been found here. Among them the long-horned caddis *Hudsonema aliena* is common in slower moving upland streams of the range, while the predatory *Hydrobiosis chalcodes* and *Psilocorema cheirodes* frequent faster moving water. All five species are common and widespread in Central Otago mountains.

#### *Plecoptera (stoners)*

Four stoner species are so far recorded from this property. These include the large and wingless *Zelandobius pennulata*, a flightless short-winged form of *Austroperla cyrene*, and the smaller *Selandobius foxi* and *Z. uniramus*. All have their larval stages associated with the clear high-altitude streams, and are distinctive and widespread species of Central Otago.

#### *Mecoptera (scorpionflies)*

New Zealand's sole scorpionfly *Nannochorista philpotti*, has been found associated with the headwaters of small streams on Kawarau Station on the Carrick Range. Most Central Otago mountain ranges have populations of this species.

Further collections were made during the DOC tenure review inspection. Identification of species collected confirmed the findings by Patrick.

Collections included specimens of the Carabid beetle *Megadromus sandageri* and elytra of *Mecodema chiltoni* found on tors in the Potters Creek catchment and the unnamed creek to the north. Both beetles are indicative of high conservation values. The reconfirmation of *M. chiltoni* is important.

On the Nevis faces, the grasshopper *Sigaus obelisci* was found. This species has a restricted distribution in Central Otago at high altitudes and is indicative of high conservation values.

### 2.5.2 HERPETO FAUNA

Searches for skinks and geckos were made at several rocky locations throughout the property. Both groups of lizards had previously been recorded during the PNAP survey.

The skink species found was the common skink, *Oligosoma maccani*, being recorded from the Potters Creek catchment and the unnamed creek to the north and Nevis faces. Geckos were confined to the eastern part of the property.

Skink collection sites appear to provide good habitat. The restricted occurrence of geckos is difficult to explain.

### 2.5.3 AVI FAUNA

The following species were recorded:

black-backed tern	Upper Potters Creek
New Zealand falcon	Upper Potters Creek, Nevis Gorge, Slapjack Creek
goldfinch	) Lower Potters Creek shrubland
chaffinch	)

blackbird	)	
Californian quail	)	Slapjack Creek scrub patches
grey warbler	)	
red poll	)	
yellowhammer	)	
skylark	)	open country
Australasian harrier	)	
pipit	)	

The New Zealand falcon is a Category B threatened species (second priority for conservation), Molloy and Davis 1994.

#### 2.5.4 AQUATIC FAUNA

The NIWA Freshwater Fisheries Database holds no records for this property, although there are records for sites just outside the boundaries, for Slapjack Creek and Long Gully (no fish recorded at closest sites) and for Bannockburn (brown and rainbow trout and perch).

One species of native fish was recorded on the property during the inspection - a "roundhead-type" galaxias, in the headwaters of Potter's Creek, at map reference F42 006 568, where this fish was common. A further species - a "flathead-type" galaxias - was found in Shepherd's Creek, at a site just south of the boundary of the property (map ref. F42 069 568). Shepherd's Creek appears to flow through a corner of the property, but it wasn't possible to access it at that point and in any case, there is a strong population of brown trout in this creek, so the remnant galaxiids are unlikely to survive in the long-term.

The roundhead galaxias (*Galaxias anomalus*) and the flathead galaxias (*G. depressiceps*) were, up until very recently, thought to be common throughout Otago and Southland (McDowall and Wallis, 1996). However, research currently under way into mitochondrial DNA linkages between galaxiid species/groups, at the University of Otago, is casting doubt on these findings. This research is not yet finalised, but until it is complete, it is safer to refer to all "roundhead-type" and "flathead-type" galaxiids outside the Taieri catchment as "types" rather than species. It also seems more than likely that the "roundhead-type" galaxias from the Nevis catchment, presumably the same as the fish found in the headwaters of Potters Creek, will be confirmed as a new and distinct lineage.

The Otago galaxiid complex, of which these fish are part, is currently ranked as Category I (Molloy and Davis, updated in Tisdall, 1994) for conservation action (species about which little information exists, but which are considered threatened).

A number of other creeks on the property were also surveyed, but were found not to contain fish - these were two unnamed tributaries of the Nevis River (sites fished were: map ref. F42 978 583, F42 966 570, F42 972 588), and Pipeclay Gully. Slapjack Creek was also fished, (at map ref. F41 989 619), but not on the property as access to it was not possible at that point, no fish were found. The Bannockburn was also fished, at map ref. F41 395 395, finding trout, but no native fish. All other streams on this property were either dry, or access to them was impossible because of dense vegetation cover.

#### 2.5.5 PROBLEM ANIMALS

In the past, Kawarau Station has had a severe rabbit problem but the effects of RHD and effective follow-up control has largely contained the problem. Evidence of large warrens, some still in use occur throughout the property even at the highest altitudes.

Goats are widespread on the Nevis faces and in Slapjack Creek, but are subject to periodic control. DOC has undertaken control on adjoining conservation lands. Monitoring and control will be necessary.

Hares occur at low density on higher parts of the property.

Possums are present throughout, especially in shrublands.

Cats and ferrets also are present, especially where rabbits persist. Several records of hedgehogs at all altitudes were noted during the inspection.

## SIGNIFICANCE OF THE FAUNA

### Invertebrate Fauna

Limited survey work on native insects has been carried out to date on this property on the Carrick Range. In general the Carrick Range supports a modest range of native insects although considerably less species than the surrounding higher mountain ranges because of the smaller number of communities and lower maximum altitude. Kawarau Station appears to have a range of plant and insect communities that encapsulate all the typical species of the Carrick Range. In particular the extensive snowgrass/herbfield, schist tors, finger bogs and upland streams are significant as they support the majority of the insect fauna and are in reasonable condition. The rock outcrops and tors in particular support a large number of lichens and some vascular plants.

Although not sampled for insects on this lease, other research work has shown that shrublands of *Olearia odorata* support a large fauna of native insects including beetles, moths, bugs and flies.

Key communities are:

- tors and rock outcrops
- summit grasslands and herbfields
- headwaters of streams and finger bogs
- riparian grasslands/shrublands
- mid-altitude shrublands of *Olearia odorata*

### Avi fauna

The records of New Zealand falcon, a Category B threatened species, are notable and probably indicate that the species breeds on the property.

### Aquatic fauna

The headwater tributary of Potter's Creek containing the "roundhead-type" galaxias population has the highest conservation value on this property. The galaxiids were numerous in this stream, and three different year classes were present. However fish were only found below the culvert (at map ref. F42 006 56800), despite apparently suitable habitat immediately upstream of it. A combination of water velocity through the culvert and a slight vertical drop at its lower end appeared to be the main factors limiting further upstream distribution.

"Roundhead-type" galaxiids are part of a complex of non-migratory galaxiids with a southern South Island distribution, being limited to Otago and Southland (a distribution shared with "flathead-type" galaxias).

It is likely that the Nevis catchment fish will be confirmed as a new lineage in the near future, making this catchment a very important site for aquatic ecosystem conservation (possibly the only catchment where this fish occurs).

The species is currently ranked as category "1" (Molloy and Davis updated in Tisdall-1994) for conservation action (species about which little information exists, but which are considered threatened).

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## 2.6 HISTORIC

### Introduction

The Kawarau pastoral lease was surveyed for historic sites over the 16<sup>th</sup>, 17<sup>th</sup> and 18<sup>th</sup> of November 1998. The area has been previously surveyed for historic and archaeological sites on two occasions; in 1978 and 1981. During these surveys approximately 90 sites were recorded. The current survey revisited about 2/3 of these sites (no effort was made to record or trace the numerous water races).

### Maori sites

No Maori sites have been recorded on the current lease. However a silcrete blade was picked up near Shepherds creek on the adjacent Carrick lease.

### European sites

Kawarau Station was once one of the foremost pastoral leases in Otago. The lease was originally taken up in 1858 by an agent for the Australian and New Zealand Land Co. Originally it ran from Clyde to Gibbston and included the Carrick, Cairnmuir and part of the Old Man ranges. The company's lease expired in 1910 and the property was subdivided. (Parcell 1951:7 &13)

The existing Kawarau Station comprises a large number of significant historic sites. The existing stone homestead and woolshed were built in the 1860s and have been registered by the Historic Places Trust as category 2 sites. However the vast majority of the sites on Kawarau are associated with the alluvial and quartz mining for gold.

### Alluvial mining

Gold in the Bannockburn area was discovered during the spring of 1862. The rising water levels of the Clutha and Kawarau rivers forced the miners off the river beaches they had worked since the original Dunstan rush of August 1862. Parties of miners prospecting the surrounding country found gold in many of the streams. The first rush was to Potter's No.1 (named after one of its discoverers John Potter who also discovered Potter's No.2 in the Old Man Range) a small creek flowing westward into the Nevis. In November 1862 there were approximately 2000 miners in this area of the Carrick range. By January 1863 they were all gone, seduced away by the rushes to the Shotover and Arrow. But by the end of 1863 about 100 miners had returned to Potters although by 1864 this had dwindled to 25. As European miners moved away from small-scale alluvial mining Chinese miners replaced them. Small numbers of Chinese continued to mine in Potters until the first decade of the 20<sup>th</sup> century (Bristow 1994:52-55).

This brief summary of mining in Potters is broadly true for all the gold bearing streams on the Kawarau pastoral lease. The main streams that were worked were the Bannock Burn, Shepherds Creek, Pipeclay and Smiths gullies (including Battery creek). Strangely Long Gully is not gold bearing and was never mined.

### ★ Recorded sites

*Note:* where sites have been previously recorded the New Zealand Archaeological Association (NZAA) site number will be used followed by the metric grid reference. All metric grid references refer to NZMS 260 F42.

### Grid reference 982 583 – 974 577

This small tributary of the Nevis has been worked between these two points. The workings consist of numerous prospect pits, well vegetated low tailings piles and small paddocks (large pits, circa 5 sq. m, from which gold bearing gravels have been dug). The general appearance of the valley floor is of a very "hummocky" terrain (fig:1). This is indicative of the earliest period of the gold rushes. The lack of sluicing sites (with one exception), absence of hut sites (with one exception) and the presence of only short narrow water races (again with one exception) support this view. The races were probably used in conjunction with sluice boxes or long toms.

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This valley is of high significance as existing sites from this era are rare, most having been destroyed by subsequent mining.

Only one hut was located (GR 980 582). It was located on the true left of the stream and consisted of low stone walls (up to .7m high) about 4.5 x 3.5m in area. Just down stream of the hut was the only area of ground sluicing in the area (see fig:2). Water for sluicing was supplied by a small race that commenced a short distance upstream of the hut.

**Grid reference 982 575**

This small creek is a tributary of the above mentioned creek. The upper reaches of the creek have been briefly worked. The main feature is a small area of low tailings (about 20m x 8m) on the true right of the creek.

**Grid reference 009 574 - 017 577**

The true right branch of the Potters Creek runs from a wide basin into a narrow gorge. With the exception of prospect pits gold working in the basin is primarily restricted to the creek entering the basin from the east. The absence of workings in the basin itself may be due to the comparatively high water table. The workings consist primarily of low tailings along the creek margins with numerous prospect pits. As with the previous sites these workings probably date from the initial period of the gold rush. There is also an area of shallow ground sluicing around the junction of the creek with a small tributary (GR 013 577). These extend for about 500m along the true left bank of the creek. While these workings may date from the later period of the gold rush the presence of two long neck beer bottles (dated 1938 & 1939) and a sauce bottle (marked "S Kirkpatrick Nelson" - a jam and sauce manufacturer active from the 1880s) indicates that some of these workings are much later.

As noted above there are numerous areas of alluvial workings in Pipeclay and Smiths Gully. These mainly consist of small areas of tailings in the beds of the creeks and are present in the gullies, in many cases, right up to the quartz workings. Of these the largest was the Perseverance Claim.

**Perseverance claim (NZAA no.s S133/762,764 & 766)**

This is located at the northern end of the ridge between Pipeclay and Smiths Gullies (GR 034 587). Rather unusually for a sluicing claim the workings are not on an alluvial terrace but on a steep hill face. The workings are about 300m x 250m in area and consist of large areas of tailings (particularly at the western end) and three large tail races (fig.3). The Perseverance Sluicing Co. was active during the late 1870s (or 1890s - Parcell (1951:90&100) seems to contradict himself). On the main ridge line above the sluicings are three large stone faced reservoirs (or dams) which presumably held water for the sluicing operations (fig.4), these have been recorded as archaeological sites S133/737 & 738.

Associated with the sluicings are the remains of at least two stone huts and other stone structures of unknown function. While these may be part of the sluicing operations they may also be part of quartz mining in the area. A shaft and adit are located near the huts and a mullock heap is present in the north east corner of the sluiced area. This area was also the site of the John Bull battery, a 5 stamp battery which was operated in the 1870s. Three quartz reefs were worked in the vicinity: the Robert Burns, Nil Desperandum and the John Bull. The Robert Burns reef was lowest on the hill. The shaft, adit and mullock heap are probably on this reef.

**Grid reference 097 594**

Only one site was recorded in the Bannock Burn. This was an area of tailings heaps from ground sluicing. The valley floor of the Bannock Burn is now largely choked with briar which obscures most of the mining evidence but aerial photos taken in 1958 show that the bed of the creek had been extensively worked for gold for much of its length and many areas of alluvial tailings are present along its banks.

### Quartz Mining

The Carrick Range was one of three major quartz mining fields in Otago. The quartz reefs were discovered on the Carrick Range in the mid 1860s. The first was the Elizabeth Reef found by John Towan in 1864. A further reef was discovered in June 1866 at the head of Pipeclay Gully and another in Adams Gully two months later. Despite these early discoveries little work was done on developing them, in part because alluvial mining (which was much cheaper and easier to carry out) was still flourishing and because the access to the reefs was so poor (only pack horses were able to be used until the dray road to the Nevis was opened in 1867 (Parcell 1951: 81).

It was the success of Thomas Logan's mine at Bendigo in 1869 that spurred the development of the Carrick reefs. In September 1869 William Jackson Barry, (butcher, one time mayor of Cromwell and noted self propagandist) rediscovered the reef found at the head of Pipeclay Gully. His flair for self promotion and the intense interest in quartz mining brought about by the successes at Bendigo focussed attention on the Carrick reefs and by the end of the year 5 mining parties were at work (ibid.). Eventually some 27 named reefs were discovered and worked (fig.s 5&6)

The early results of the reefs were promising, many yielding several ounces of gold per ton of ore. But in common with most of the reefing areas in Otago the gold values declined as the depth of the workings increased. The reefs also tended to be quite narrow and faulted which also added to the difficulty of working them. By 1880 many of the mines were closed but periodically mines would be reopened for brief periods of time for the next 42 years each time ending in financial loss.

Most of the reefs are contained within a comparatively small area with the majority located on three spurs or ridges; between Pipeclay and Smiths Gullies, Smiths and Battery Creek and Battery creek and what is now the Carricktown Walking Track (the old Nevis road). With the exceptions of the Young Australian and the White Horse reefs, all are on the current Kawarau pastoral lease. Not all 27 reefs were revisited during the survey, in part due to time constraints, but also because the spread of briar has made access to some areas difficult.

#### Recorded sites:

##### S133/726 (GR 026 571):

A prominent mullock heap located in the head of Pipeclay Gully, just north of the Carricktown - Nevis road. There are small scale alluvial workings in the bed of the gully for several hundred metres down stream. There are two reef lines in this area; the Royal Standard (the first to be discovered) and the Stanley.

##### S133/736 (GR 032 582):

Four mullock heaps on the hill face above the true right of Pipeclay Gully. There is only one adit clearly visible. Two probable tram lines run down the slope to the north towards a nearby battery site. There was a reef known as the Kohinoor 1 worked in this area in the early period of mining, the area was also reopened in 1896 and worked by the Golden Gate Co. (Parcell 1951:100).

On the bank of the creek below the quartz workings is an area of alluvial tailings and two stone huts (fig.7) (S133/739). The larger of the two huts is built on the edge of a tail race from the alluvial mining; it is therefore more likely that this hut postdates the alluvial mining and is associated with the quartz mining on the hill above.

##### S133/746 (GR 031 582).

A battery site on the true right of Pipeclay Gully. Remaining at the site are dismantled parts of a small 2 (?) stamp battery including a fly wheel and camshaft, mortar box and a stamper (fig.8). This is assumed to be the remains of the Golden Gate battery which operated briefly in the late 1890s (see above).

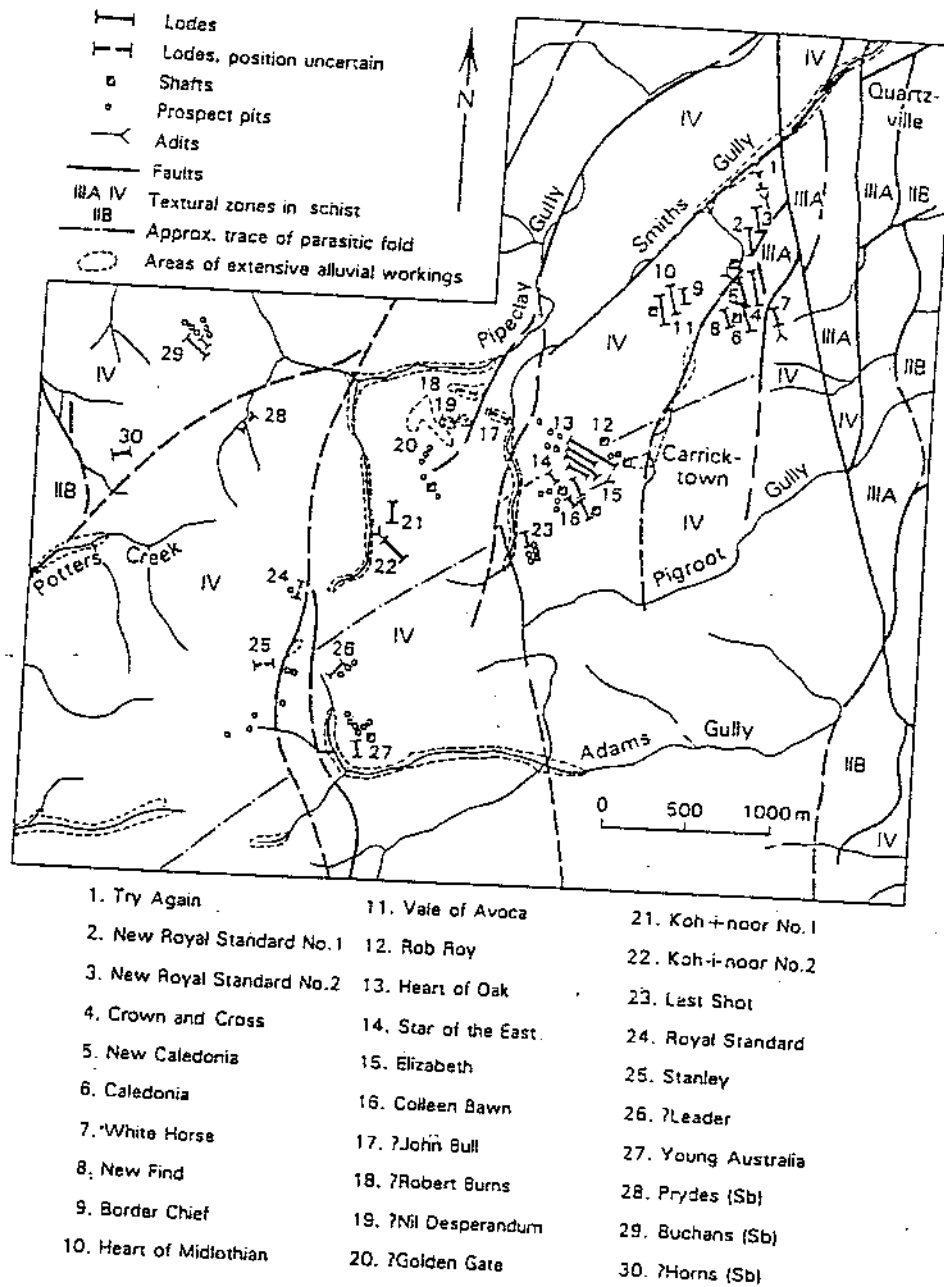


Fig. 5: Geological map of the Carrick goldfield.  
(from Turnbull 1988)

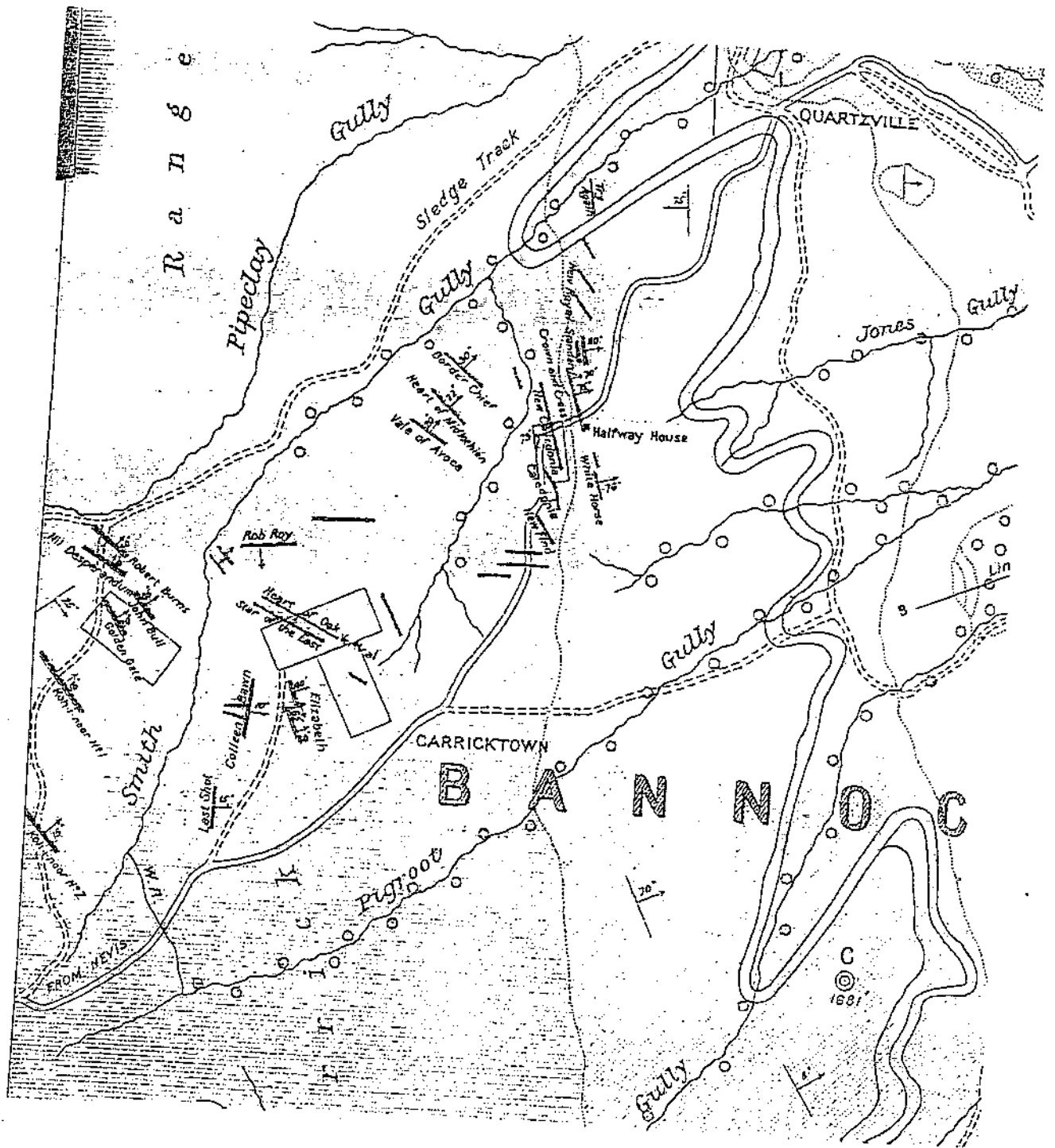


Fig. 6: Major quartz reefs on the Carrick Range.  
 (from Park 1908)

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S133/414, 415 & 733 (GR042 579)

Last Shot mine site. These quartz workings are situated just to the west of Carricktown - Nevis road immediately below two stone faced storage dams, the southern dam is on the Carrick side of the boundary fence which runs through the middle of the site) which are located on the crest of the ridge (fig.9). The site consists of the ruins of a small stone building about 3m square and two mullock heaps. There are at least three infilled shafts. The Last Shot Co. operated briefly in the early 1880s.

**Grid reference 042 581:**

A reservoir site immediately adjacent to the road. While the site is readily visible it does not appear to have been recorded previously. The reservoir is built in a low saddle and consists of two low walls about 35m long about 20m apart. The natural hill slope provides the other walls. Immediately to the north of the reservoir are several prospect pits/shafts, a trench and mullock heaps. It is possible that these represent workings on the Colleen Bawn reef which was briefly worked in the early 1870s.

**Grid reference 048 583:**

This grid reference refers to where the Carricktown track crosses the head of Battery creek. This location is perhaps the heart of the Carrick goldfield. On the slopes to the west and north of the ford are the sites of the Elizabeth, Star of the East and Heart of Oak mines. East and north of the ford are the building remains of what was Carricktown. As a historic site the significance of this area is as high as Bendigo or Macetown for its evidence of both lifestyles and mining techniques. Indeed it is closely associated with Bendigo as many of the individuals involved with the development of the mine on the Carrick were also involved at Bendigo. Similarly many of the businesses that were set up at Carricktown or at Quartzville, the settlement at the base of the range, had originally been located at Bendigo.

Much of the Elizabeth workings are overgrown with scrub, but the Star of the East/Heart of Oak workings are still plainly visible as mullock heaps (fig.10), open workings and collapsed shafts and adits. The Star of the East and Heart of Oak reefs were next to each other and now it is not possible to distinguish one from the other. Work on both reefs started in 1871 and initial results were encouraging. The companies combined to erect a 10 stamp battery (S133/740), part of the wooden structure is still visible (fig.11). However as the miners tunnelled deeper into the hillside the gold returns declined and by the end of the decade both mines were no longer financially viable. Despite this various parties reopened the mines until the end of the century - with no real success (Parcell 1951:94 - 97).

Approximately 16 building sites are still visible in the vicinity of the Battery Creek ford (sites S133/398 - 410). Most of the remaining building sites are the ruins of stone walled buildings (fig.12) but flat terraces which probably were the sites of either tents or corrugated iron buildings are also present. In the 20 years since the original survey was carried out there has been a noticeable deterioration in these sites; stone walls have collapsed and some sites have become overgrown by scrub. Carricktown developed as a service centre for the adjacent mines. A store and bakery, an hotel, possibly a second hotel and several small houses or huts had been erected by the end of 1871. The huts were primarily occupied by miners working at the three mines.

**S133/776 (grid reference 051 594):**

Day Dawn battery site. All that remains of this site are extensive stone walling and the timbers of the battery structure. This was a four stamp battery which was erected by the Lawrence brothers in 1889 to crush ore mined from several reefs in the area. Site is marked by prominent poplars and 3 mullock heaps.

**S133/781 (grid reference 052 603)**

This site consists of the remains of a battery site on the true right bank of Smiths creek. Some charred heavy timbers and a concrete foundation (probably for the steam engine) and the terracing cut into the toe of the hill for the battery building are all that remains of the battery. On the slope above the battery site are the remains of an incline tramway and a stone walled

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ore hopper(?). The incline connected the battery to a tramline that ran from an adit just north of the incline back up Battery Creek to the previous site.

This was the site of a ten stamp battery and four cyanide vats constructed by the Carrick Gold Mining Co. The company was formed in 1911 to prospect and work several of the reefs on the lower slopes of the range (the New Royal Standard reef is on the hill side directly above the battery site). The company was reformed in 1917 as the Otago Central Consolidated Gold Mining Co. but as with all the previous mining ventures it ended in failure and the battery was dismantled in 1921 (Parcell 1951:92). It should also be noted that in this vicinity there has been recent exploration for gold by Summit Gold of Australia.

#### **Other historic sites:**

The metal antimony was also briefly mined on the Carrick range. It is used in paint pigments and when combined with other metals in alloys it increases the alloy's hardness. Antimony alloys also have the unusual property of expanding when cooled so it is used in the manufacture of metal castings.

There are three reefs, known as Buchan's, Prydes, and Horns, located on the ridge between the head of Pipeclay gully and Long Gully. However these were not visited during this survey. For a brief period of time in the early 1880s there was an antimony smelter in Bannockburn but the industry soon collapsed (Parcell 1951:100-102).

Finally a stone musterer's hut (fig.13) was recorded on the western slope of the Carrick range, high above the Nevis river (GR 972 589). This is a small hut (about 3.5m x 5m) of stacked stone construction of unknown age (but possibly turn of the century - 20<sup>th</sup> century).

### **SIGNIFICANCE OF HISTORIC FEATURES**

There are two areas of significant historic sites on Kawarau Station; the alluvial mining sites on the top of the range and the Carrick quartz mines. The alluvial sites are significant because they date from the period of the initial gold rush to Central Otago; a class of sites which are now rare.

The Carrick quartz mines are of high significance. They may be compared with Bendigo and Macetown as outstanding examples of quartz mining for gold and the small communities that grew up around the mines. The Carricktown area is a particularly significant area as it contains good examples of the whole system associated with quartz mining, including mines (Elizabeth, Star of the East and Heart of Oak), battery sites, the service centre of Carricktown and large parts of the water reticulation systems that were required to operate the batteries.

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## **2.7 PUBLIC RECREATION**

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### **2.7.1 PHYSICAL CHARACTERISTICS**

The Carrick Range is a northwards extension of the Old Woman Range. It differs in character from the higher block mountain range in Central Otago, being more dissected by narrow gullies and relatively sharp ridges. The crest height is markedly lower than the adjacent ranges.

In 1992, DOC compiled a Recreation Opportunity Spectrum for the entire conservancy, whereby all areas regardless of land tenure, were classified and mapped according to setting, activity and recreational experience characteristics.

The zoning of Kawarau Station reflects the property's landform and topography, and is all included in the backcountry 4x4 drive-in zone.

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This zone is characterised by a feeling of relative remoteness from populated areas. The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education and nature appreciation. Four wheel drive vehicles are desirable in this zone to give access to high country tussock grasslands and block mountains and more rugged remote areas.

### 2.7.2 LEGAL ACCESS

The property is accessed via the formed legal Bannockburn Road. Internal legal formed access is limited to Quartzville Road, leading off Schoolhouse Road at Bannockburn. This road is also known as the Carricktown Walking Track.

The lower part of Quartzville Road where it adjoins freehold titles appears to be on the legal alignment. Through the pastoral lease, the formed route may follow the legal road to the boundary with Carrick Station.

An unformed legal road is located along the frontage with the Nevis river.

A Walkways Act easement provides public foot access from Felton Road via the Bannockburn Shuicings Protected Private Land to the Long Gully Bluffs Conservation Area. Currently the use of the easement is restricted to Sundays and Mondays only, from 1 December to 30 September with closure during 1080 rabbit poisoning operations. The easement crosses both Kawarau and Mt Difficulty pastoral leases.

There are no existing marginal strips along any other watercourses.

### 2.7.3 ACTIVITIES

The property attracts only occasional winter recreational use, ie, cross-country skiing due to its modest altitude creating unreliable snow cover.

Summer recreation use often involves 4WD vehicles which can access the high altitude lands either from the Quartzville Road or the farm access track from the Nevis Road via Watts Rock and Carrick Station. It is possible to exit the property via Slapjack Saddle and Long Gully via farm access tracks.

A popular pastime is visiting the early gold mining sites centred on Carricktown via the Quartzville Road (Carricktown Walking Track). This is a regular activity for students using the Outdoor Education Centre at Bannockburn.

There is potential for mountain biking and horse trekking on legal roads and formed farm access tracks within the property.

Some goat hunting probably occurs on the Nevis Faces.

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## PART 3

### OTHER RELEVANT MATTERS AND PLANS

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#### 3.1 CONSULTATION

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The property was commented on by NGOs at an early warning meeting on 3 December 1998.

Key points raised were:

- High historic site concentration around Carricktown.
- Carricktown access to be secured, to provide for public vehicle access.
- Access linkages to Duffers Saddle via Carrick Station and Bannockburn via Mt Difficulty for horse, mountain bike and foot use should be anticipated through tenure reviews of those properties. Given the dry climate of the Carrick Range, such access linkages could possibly be available for public vehicle use also, as the potential for damage to tracks and fragile areas is considered to be low.
- Nevis Gorge is important as a visual corridor associated with a wild and scenic river. Public access along the river is required.
- Public foot access should be extended from the Victoria Bridge easement, (ex Wentworth tenure review), up the leading ridge on south side of Slapjack Creek to link with Long Gully.

A written record of the above interests has been supplied by Mike Floate on behalf of Federated Mountain Clubs. FMC has also supplied a Preliminary Report on the Recreational and Related Significant Inherent Values of Kawarau and Mt Difficulty Stations, which is attached.

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#### 3.2 DISTRICT PLANS (Matters of National Importance)

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Kawarau Station is located within the Central Otago District which is currently subject to the provisions of two planning documents; the current plan (the transitional district plan) and the Proposed District Plan. The transitional district plan remains the principal planning document at the present time. However, both documents are used when assessing activities involving the use of natural and physical resources in the district.

Under the transitional Central Otago District Plan the entire property is zoned Rural 1. Rural 1 is the zone comprising the district's productive land which is predominantly utilised for intensive grazing, pastoral use, horticulture, market gardening, etc. Conditional uses include industries ancillary to farming and other primary industries.

Section 6c of the RMA (1990) requires council to recognise and provide for protection of indigenous vegetation and significant habitats of indigenous fauna, as a matter of national importance.

The proposed Central Otago District Plan released for public submissions in 1998, the documents states that the council shall:

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- Encourage and advocate to DOC that the department negotiates directly with landowners whose properties may contain areas of significance worthy of protection.
- b Encourage and advocate to Central Government, that in consultation with affected lessees, areas of significance be appropriately protected through the tenure review process.
  - c Encourage land owners to provide voluntary protection and enhancement for such areas.
  - d Review the extent to which significant areas are protected by being included in the conservation estate, or made subject to restrictions to protect natural values once the tenure review is complete or when the district plan is reviewed, whichever is earlier.

Only areas with current formal protection have been identified as areas of significant natural value. For this reason no such areas are present on Kawarau Station.

The property is in the Rural Resource Area zone of the proposed plan.

Controlled activities in the proposed plan are residential activities, subdivision, and retail activity. There are a number of standards which provide the basis for the other types of activities. Restricted activities include activities in breach of standards on tree planting, storage and signs. Discretionary activities include activities in breach of standards on residential activities, traffic generation, earthworks and outstanding and significant landscapes. Non-complying activities include activities in breach of the significant indigenous vegetation, habitats of indigenous fauna and wetlands (matters of national importance) standard.

## PART 5

## ATTACHMENTS

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**5.1 ADDITIONAL INFORMATION**


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**5.1.1 REFERENCES**

- Bristow P, 1994 : Archaeology and Ethnicity of the Remote Otago Goldfields. Unpublished Masters Thesis, Department of Anthropology, University of Otago.
- Brumley C F, Stirling M W and Manning M S, 1986 : Old Man Ecological District - Survey Report for the Protected Natural Areas Programme, Department of Lands and Survey, Wellington.
- Floate MJS, 1999 : Preliminary Report on Recreational and Related Significant Inherent Values, Central and North Otago Properties 3. Kawarau and Mt Difficulty. Unpublished report for Federated Mountain Clubs of NZ (Inc).
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- Molloy J and Davis A, updated Tisdall C, 1994 : Setting Priorities for the Conservation of New Zealand's Threatened Plants and Animals. Department of Conservation, Wellington.
- Park J, 1908 : The Geology of the Cromwell Subdivision. Government Printer, Wellington.
- Petrie A, 1998 : Kawarau Pastoral Lease Landscape Assessment, Unpublished report to the Department of Conservation, Dunedin.

**5.1.2 EXTRACTS**

- Brumley C F, Stirling M W and Manning M S, 1986 : Old Man Ecological District - Survey Report for the Protected Natural Areas Programme, Department of Lands and Survey, Wellington, pp 96-103.
- Floate M, December 1998 : Notes of NGO's Early Warning Meeting Otago/Southland; Kawarau Station.

**5.1.3 TERMS AND CONDITIONS**

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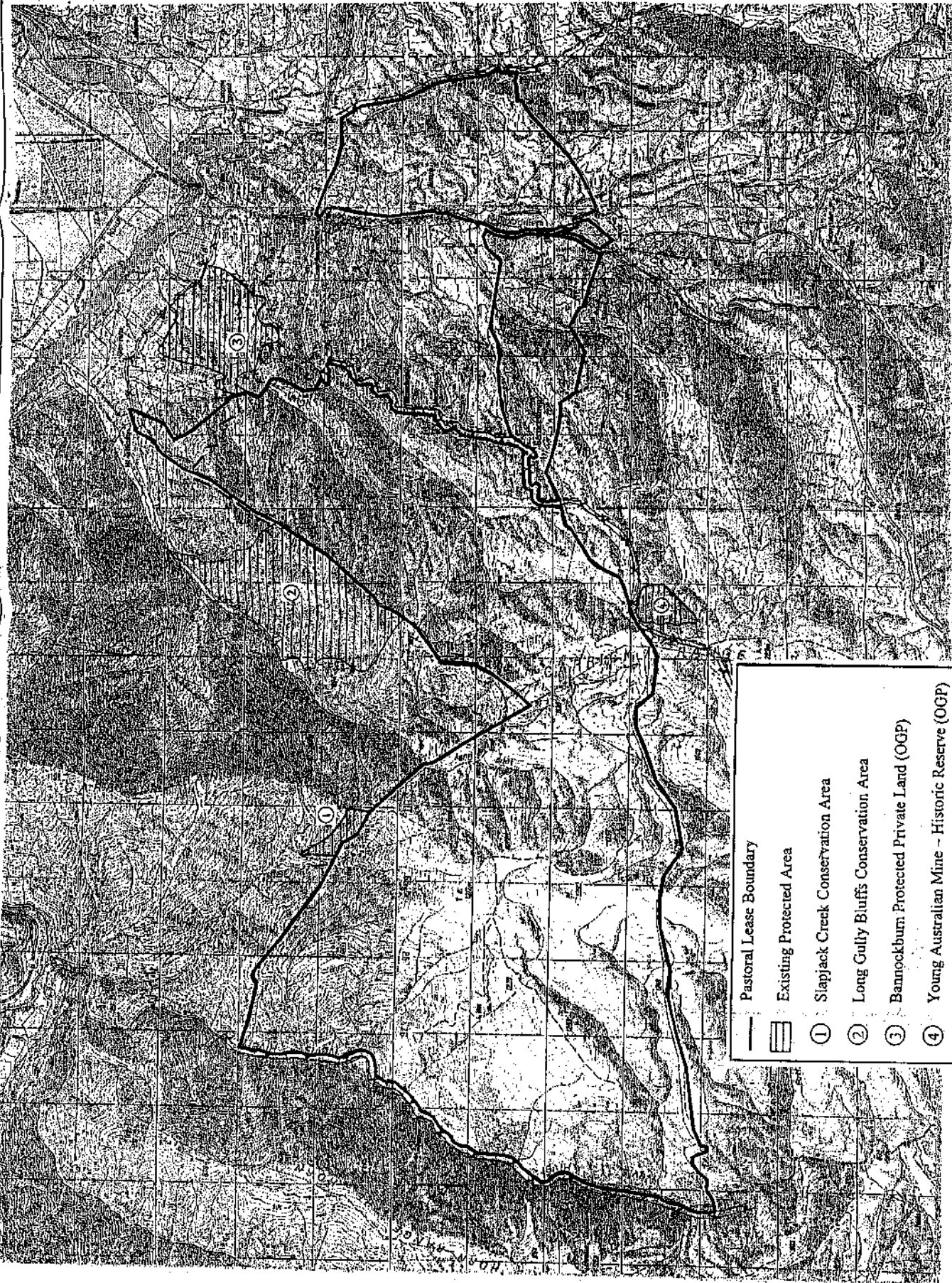
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**5.2 ILLUSTRATIVE MAPS**

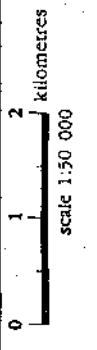
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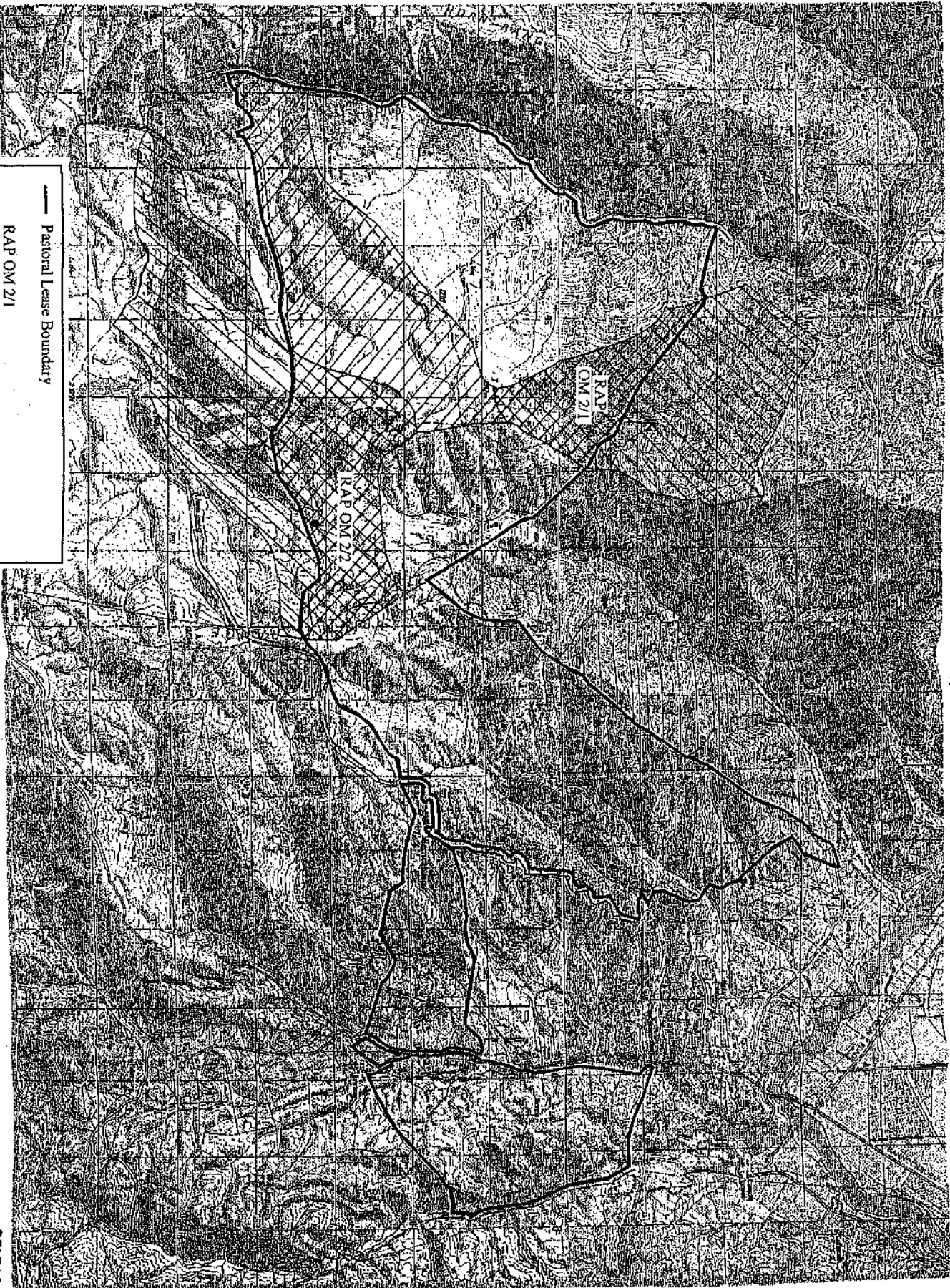
- 5.2.1 Topo/Cadastral
- 5.2.2 Values
  - a Landscape  
Historic
  - b Ecological
- 5.2.3 Boundaries (for Official Use Only)

RELEASED UNDER THE  
OFFICIAL INFORMATION ACT



- Pastoral Lease Boundary
- ▨ Existing Protected Area
- ① Slapjack Creek Conservation Area
- ② Long Gully Bluffs Conservation Area
- ③ Bannockburn Protected Private Land (OGP)
- ④ Young Australian Mine - Historic Reserve (OGP)
- x x Legal Roads
- Walkway Easement to Long Gully Bluffs Conservation Area



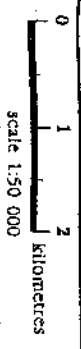


— Pastoral Lease Boundary

▨ RAP OM 21

▨ RAP OM 22

• Galaxioid record

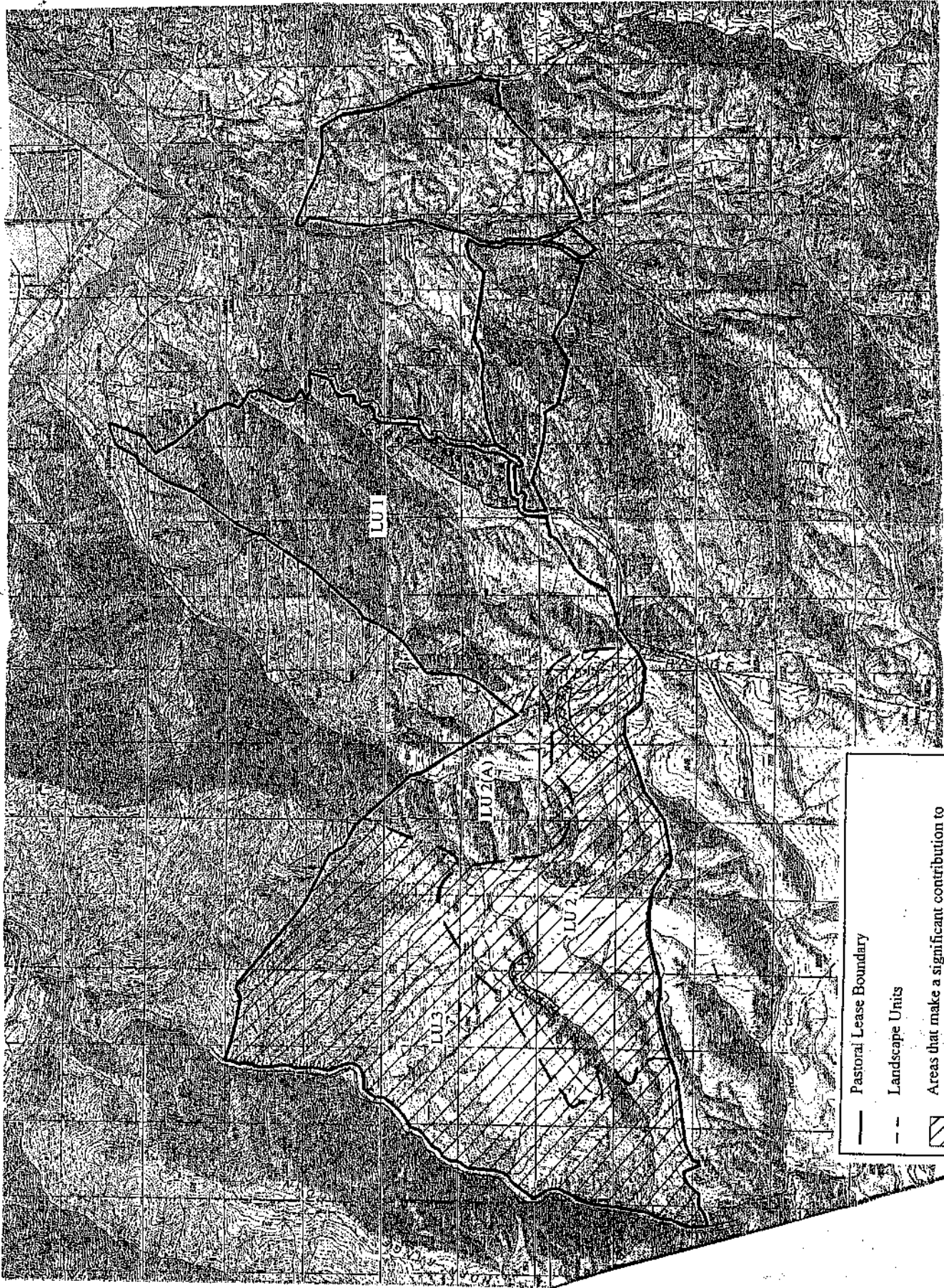


KAWARAU  
PASTORAL LEASE  
Ecological Values  
Map 2b

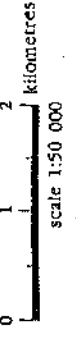
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OFFICIAL INFORMATION ACT



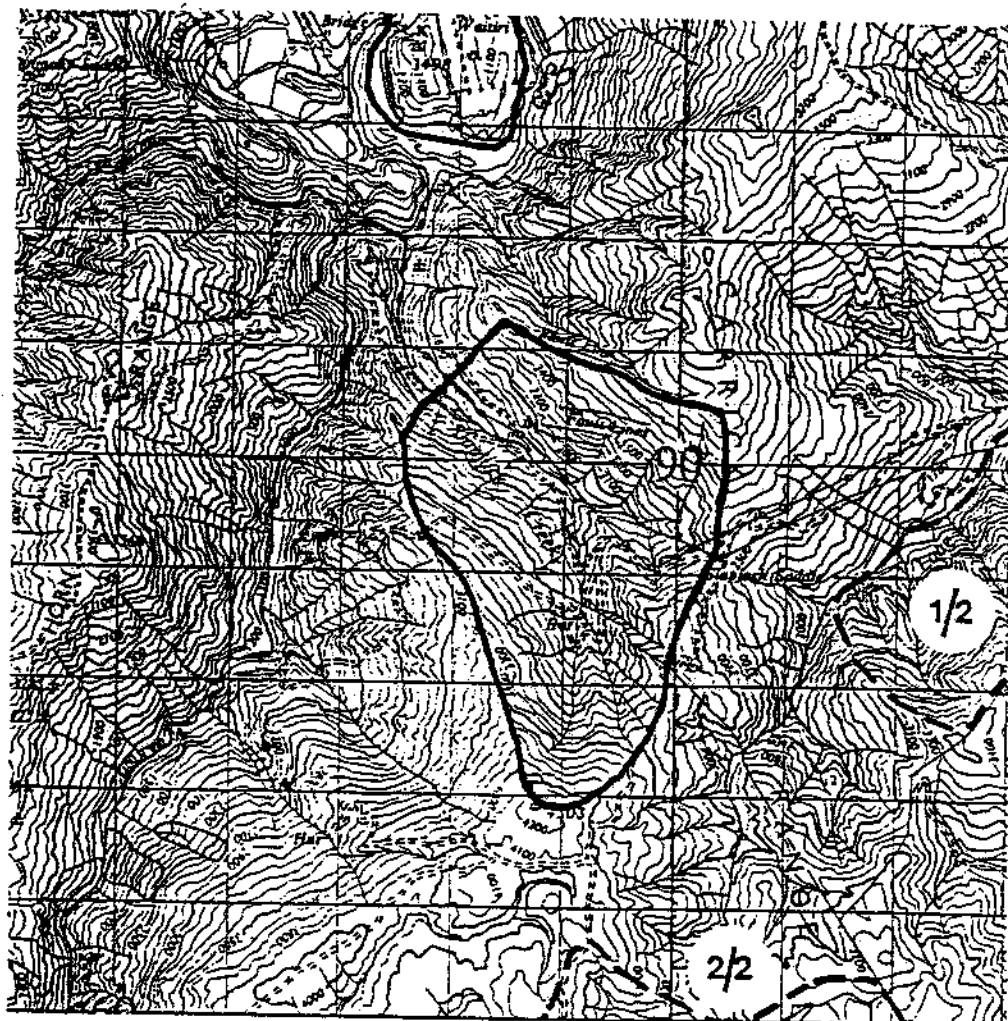
N




- Pastoral Lease Boundary
- - Landscape Units
- ▨ Areas that make a significant contribution to the natural character of the high country landscape
- ⊗ Significant alluvial mining sites
- ⊙ Significant quartz mining sites



2/1: SLAPJACK CREEK



SCALE	:		Kilometres
GR CENTRE	:	NZMS1 S133 890640	
AREA	:	630 ha	
ALTITUDINAL RANGE	:	400m - 1310m	
TENURE	:	Crown land ; pastoral lease.	
DATE REFERENCE	:	Study Area 09.	

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## 2/1 : SLARJACK CREEK , ECOLOGICAL UNIT CHECKLIST

BIOC. ZONE	VEGETATION COMMUNITY	ECOLOGICAL UNIT	ALTITUDINAL RANGE	REP. AREA	SAMPLE SITE NO.	PRIORITY AREAS w. SIMILAR UNITS
Low-alpine	Mixed	Mixed alpine vegetation on outcrop & rubble	1070-1310m	S	09-06,26	1/7,12; 2/2,3,4
"	Mixed tussock	CHIRIG - FESNOV on colluvial slopes	1160-1310m	S	09-23,24	1/1,4,7,9; 2/2,3
"	Herbfield	ACIAUR - FESNOV, FESMAT on colluvial slopes	1180-1250m	S	09-22,25	1/1,2,4,5; 2/2
"	Silver tussock	FOALAE tussockl'd on ripply colluvial slopes	910-1130m	M	09-03	1/7; 2/3
"	"	" on colluvial slopes	1000-1020m	M	09-19,21	1/1,2,3,5
"	Fescue tussock	FESNOV tussockl'd on colluvial slopes	980-1020m	S	09-20	1/1,3,4,5,7,9; 2/2
Subalpine	Shrubland	DISTOU - FESNOV, FOALAE on colluvial slopes	730-1010m	L	09-02,16	2/3
"	Wetland	Sedge / Rush flush on seepage	950m	S	09-18	1/1,3,4,7,13; 2/2,3
"	Scrub	Dense DISTOU on outcrop & rubble	760- 950m	M	09-17	2/2,3
"	Mixed	Mixed low altitude on talus slope vegetation	800- 850m	M	09-08,09	1/2,3
"	Scabweed	RAOANS - FESNOV, FOALAE on colluvial slopes	710- 830m	M	09-04	1/2,3,4; 2/2,3
Montane	Scrub	Diverse scrub on outcrop & rubble	550- 760m	M	09-01,05,11, 14	1/1,3; 2/2
"	Silver tussock	FOALAE tussockl'd on colluvial slopes	500- 670m	M	09-12	1/1,2,3,5
"	Shrubland	THEVUL shrubland on colluvial slopes	520- 610m	L	09-10	1/3,7
"	Scrub	OLECOO - DISTOU + COPPRO on colluvial slopes	490- 540m	M	09-08,09	none
"	Wetland	Sedge / Rush flush on alluvial surface	490m	S	09-07	1/1,4,7; 2/2

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2/1: SLAPJACK CREEK

LANDFORM

Deeply incised reentrant catchment draining the western slopes of the Carrick Range above the Nevis-Kawarau confluence.

Extensive mass movement topography is present over the catchment, formed through rapid fluvial downcutting and faulting.

Southern and eastern slopes are ripply, slump features of small and large dimensions occur throughout, and a large earthflow is located at the catchment head. Rubbly landslide debris mantles the western flanks.

Northern slopes have complex slumping in three large features: eastern ripply topography; mid catchment gravity faulting (five faults) and rubbly blockslumping/landsliding with mass movement caverns, large boulders and slump terracing to the west.

The main channel is deeply entrenched into the landscape and northeast trending, probably following a fault that has produced a bluffy scarp and alluvial backup in the gully below Slapjack saddle.

Steep gorge derivative flanks occur in the lower catchment.

A descending altitudinal sequence of yellow-brown (Carrick, Dunstan), and yellow-grey (Arrow) hill/steep land soils. These are locally sheet and gully eroded on sunny steep aspects.

VEGETATION

Fescue and silver tussocklands dominate the catchment with a variety of scrub communities.

Fescue tussocklands occur mainly on north-facing slopes, while silver tussock is more prominent on damper south-facing slopes. Introduced grasses and herbs dominate the understory.

Distinctive open matagouri shrubland over fescue tussockland dominates the central valley slopes. Denser matagouri - Coprosma - Olearia scrub lines the bouldery stream channel.

Fault bluffs support a variety of scrub and herb species including the local endemic Lepidium kawarau and dense patches of native broom (C.petriei, C.compacta).

Patches of narrow-leaved snow tussock occur around the ridgeline tors and debris above the headbasin. Blue tussock, golden spaniard, and a variety of scrub species including Pimelea spp, Cyathodes spp, Carmichaelia monroi and coral broom are also prominent.

Mid-catchment ridge crests and north-facing slopes have very sparse vegetation cover. Raoulia species are prominent on upper slopes with thyme becoming abundant towards the lower catchment.

FLORA

Lepidium kawarau - Endangered; endemic to Kawarau valley.

Coral broom - few recordings. At southern limit in Old Man Ecological District.

Carmichaelia monroi - a southern extension of its previous range.

## DISCUSSION

This is a relatively deep catchment for the Carrick Range and lacking the characteristic asymmetric profile. Individual landscapes though are typical of the Range with dramatic mass movement topography over much of the catchment and derivative slopes in the lower reaches.

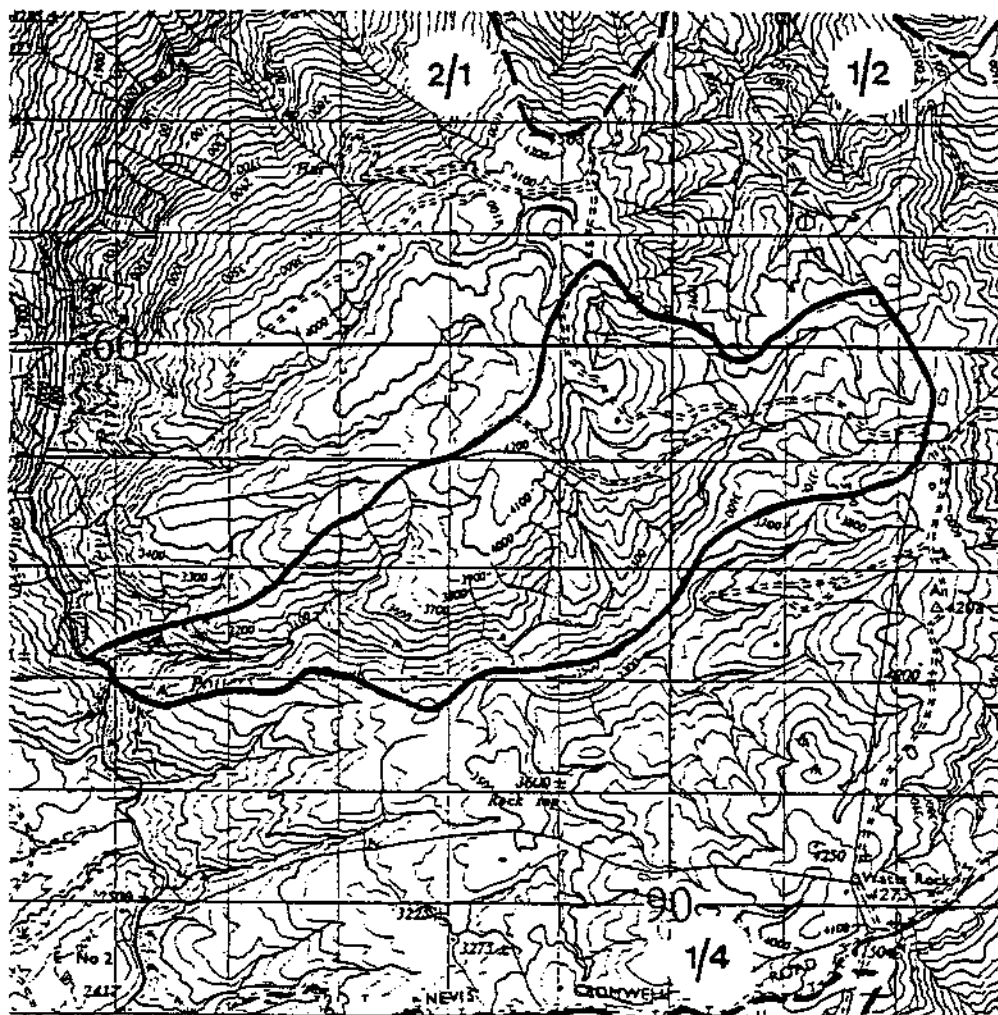
Extensive low altitude tussocklands and scrub communities are ranked as a 2nd priority alternative to the Mt. Difficulty area (1/1). Rock outcrops harbour a variety of important scrub and herb species. The catchment lacks any native grassland communities typical of the northern part of the District. Ground cover throughout the catchment shows a prominence of exotic species.


The common gecko and skink were both abundant around rock outcrops. Grey warbler and redpoll were seen in scrub patches; yellowhammer and skylark over open country; harriers were seen in main valleys. Many goats were seen on western side of the Nevis valley, and evidence of grazing by goats and rabbits was recorded in this catchment.

## CRITERIA SUMMARY

REPRESENTATIVENESS	- M	- Low altitude tussock and scrub communities ; lacks grasslands typical of northern ranges.
DIVERSITY	- M	- Variety of scrub remnants.
NATURALNESS	- M	- Exotic ground cover species ; lower slopes with induced associations.
SPECIAL FEATURES	- H	- Species of limited distribution (see FLORA). - Fault scarp, gravity faults, northern rubbly slump/landslide feature.
VIABILITY	- M	- Small and remnant examples of snow tussock scrub communities ; large areas of accelerated erosion.
BUFFERING	- M	- Good catchment boundaries ; surrounding areas modified with briar, exotic grasses.
THREAT	- M	- Erosion, exotic invasion.
LANDFORM	- M	- Representative of mass movement and derivative landscapes of Carrick Range. Extensive mass movement slopes, steep lower gorge.

2/2: POTTERS CREEK



SCALE	:		Kilometres
GR CENTRE	:	NZMS1 S133 890985	
AREA	:	900 ha	
ALTITUDINAL RANGE	:	610m - 1280m	
TENURE	:	Crown land ; pastoral lease.	
DATA REFERENCE	:	Study Area 21.	

2/2 : POTTERS CREEK , ECOLOGICAL UNIT CHECKLIST

BI	VIIC	VEGETATION COMMUNITY	ECOLOGICAL UNIT		ALTITUDINAL RANGE	REP. AREA	SAMPLE SITE NO.	PRIORITY AREAS v. SIMILAR UNITS
Low-alpine	Mixed	Mixed alpine vegetation	on	outcrop & rubble	1010-1210m	S	21-16,19,22,33,36	1/7,12; 2/1,3,4
"	Herbfield	ACTAIR - FESNOV, FESMAT	on	colluvial slopes	1080-1210m	L	21-28,35	1/1,4,5; 2/1
"	Mixed tussock	CHIRIG - FESNOV	on	colluvial slopes	1100-1190m	L	21-30,32,34	1/1,4,7,9; 2/1,3
"	Fescue tussock	FESNOV tussockl'd	on	colluvial slopes	900-1190m	L	21-11,12,13,14,17,23,24,29	1/1,3,4,5,7,9; 2/1
"	Snow tussock	CHIRIG - POPCUL - RAOSUC	on	colluvial slopes	1100-1160m	M	21-26,31	1/1,2,5,7,8,12,13; 2/4,5,6,7
"	Wetland	Carex - moss bog	on	alluvial surface	1040-1160m	S	21-20,27	1/4,5,6,7,11; 2/8
"	"	"	on	seepage	1080-1120m	S	21-25	1/1,5,7,11; 2/4,6
Sub / Low alpine	"	Sedge / Rush flush	on	alluvial surface	910-1070m	M	21-10,15,21	1/1,4,7; 2/1
Subalpine	Scabweed	RAOAS - FESNOV, POALAE	on	colluvial slopes	860-1000m	S	21-08	1/2,3,4; 2/1,3
"	Fescue tussock	FESNOV tussockl'd	on	rippy colluvial slopes	790- 900m	M	21-05	1/1,2,4,7; 2/3
"	Scrub	Diverse scrub	on	outcrop & rubble	700- 880m	S	21-02,06	1/1,3; 2/1
"	"	Dense DISTOQ	on	outcrop & rubble	710- 850m	M	21-01,03,04	2/1,3

#### LANDFORM

Lightly and regularly incised landscape with vestiges of an old westward sloping plateau.

The catchment head is low with a high-reaching main gully and alluvial depressions near the northern drainage divide - indicative of progressive capture by steep northern catchments. Rounded tor-studded ridges flank the catchment on the northwest, east and south.

Mid-catchment areas have two moderately deep valleys with wide alluvial floors and a steep reduced interfluvium. Isolated slump features occur amongst the regular colluvial slopes.

The lower catchment is steep and gorgey with flanking bluffs, buttresses, steep colluvial slopes, slumps, extensive rubble/scree, and a steep main stream.

A descending altitudinal sequence of yellow-brown (Carrick, Dunstan), and yellow-grey (Arrow) hill/steepland soils. These are locally sheet eroded on steep and exposed localities.

#### VEGETATION

Fescue tussocklands dominate much of the catchment with narrow-leaved snow tussock prominent on upper north to northeast-facing slopes.

Blue tussock is subdominant in fescue tussocklands throughout the catchment; golden spaniard is abundant across summit areas and dry ridge crests; Maori onion and silver tussock are more common on damp south-facing slopes. There is an increasing exotic component in the understorey towards the base of the catchment.

Snow tussock forms dense stands in the upper catchment with few inter-tussock species, mainly Cyathodes fraseri, Helichrysum bellidioides, Gaultheria depressa, and blue tussock. Isolated patches lower down the catchment are confined to damp hollows and gullies.

Rock outcrops in the upper catchment harbour a diverse range of scrub and herb species including Helichrysum selago, Dolichoglottis lyallii, Myrsine nummularia, and Cassinia vauvilliersii.

Dense scrub confined to the lower gorge is dominated by matagouri, Olearia spp., native broom and a variety of liane species.

Extensive flushes along upper stream valleys are dominated by mosses, cutty grass, and Schoenus pauciflorus. In the lower, deeper valleys exotic herbs and grasses dominate streambank vegetation.

#### FLORA

Typical of the southern Carrick Range.

#### DISCUSSION

This catchment is representative of the older structural landscape of the southwestern Carrick Range as a remnant of the original block faulted/tilted terrain. The catchment is more deeply incised

Priority example Barn Creek (1/4) due to the deepened base level of the lower Nevis gorge. It is a less spectacular example of the old structural landscape as it has also lost the continuity between structural basin and sloping plateau through fluvial erosion during downcutting formation of the gorge (cf. Barn Creek which has the wide Nevis basin at its base). It shows typical tor landscape in the upper catchment, and has a steep rocky lower catchment.

The state of capture of the catchment head by active deep northern catchments (Long Gully, Pipeclay Gully) is important in terms of a typical contrast between old and young landscapes. This has produced the gentle landscape at the catchment head.

Tussocklands throughout the catchment contain a moderate to high component of exotic species. Fescue tussocklands show a diversity of community associations similar to that found in Barn Creek. The narrow-leaved snow tussocklands are the most extensive stand recorded on the northern ranges (Carrick, Cairnmuir). Lower slopes show areas of erosion and severe soil depletion with sparse vegetation cover. Scrub communities are limited in extent but appeared vigorous and diverse, with a particularly good liane flora. Snow totara scrub was absent from this catchment.

Mid-catchment alluvial surfaces and flush communities are extensive. They include areas of old goldmining tailings.

The common skink ("spotted" form 1986) was numerous in the upper catchment; goats were seen on lower slopes across the Nevis. Goldfinch and chaffinch were found in scrub patches; black-backed terns were seen flying over the upper catchment. The New Zealand falcon was seen flying over the area - these birds are often seen around the vicinity of Watts Rock. Shag nests and NZ falcon roosts were found (NZ Wildlife Service 1986) on Nevis gorge bluffs just north of this catchment.

Overall this catchment provides a comprehensive 2nd priority alternative to Barn Creek.

#### CRITERIA SUMMARY

REPRESENTATIVENESS	- H	- Tussock and scrub communities of southern Carrick Range.
DIVERSITY	- H	- Good altitudinal diversity of communities.
NATURALNESS	- M	- Native canopy generally remains intact but exotic modification of ground species.
SPECIAL FEATURES	- L	- Typical flora. - Extensive mid-catchment alluvial surfaces (with tailings).
VIABILITY	- M	- Main communities extensive, intact canopy.
BUFFERING	- M	- Poorly-defined catchment boundaries. Surrounding areas in similar condition. Access around head of catchment.
THREAT	- M	- Increase in exotic, induced native modification by grazing pressure, erosion.
LANDFORM	- H	- Representative of sloping plateau landscape; prominent tor landscape; deep rocky lower gorge.

GOs Early Warning Meeting OTAGO/SOUTHLAND December 1998

Notes from Mike Floate on behalf of FMC

KAWARAU STATION Carrick Range, Bannockburn, Central Otago

Runholder: Richard Anderson  
Map Sheet(s): F 41, F 42

Phone: (03) 445 0089

K-F Contact: Phil Murray

The following features are of particular interest/importance for current and potential recreational users of this property:-

- This property is run in association with Mount Difficulty which is also in the tenure review process and has already reached Step 15. The recreational aspects of Kawarau Station cannot be considered independently of Mt Difficulty. Mt Difficulty occupies a commanding position at the bottom end of the Kawarau Gorge and is important for day trips to its commanding summit, although the summit is the site of several communications towers.
- Access through Slapjack Saddle would be important for potential mountain bike trips from Cromwell/Bannockburn to the true right of the gorge. An access easement should be negotiated.
- There are many relics of the gold mining era on the lower Eastern slopes of Kawarau Station. These add significantly to the interest of the area for day visitors (both locals and tourists) and should be readily accessible to the public.
- Many of these relics are within easy reach of the historic route up the Carricktown Track and on to the Young Australian Water Wheel. Consideration should be given to protecting these relics as a Historic Reserve which might also include the historic Carricktown Track itself, if not an easement needs to be established
- As well as day trips, longer through trips could also be important in providing access to the Nevis and, via Duffers Saddle, to points further south on the Carrick, Old Man and Old Woman Ranges.
- The Nevis River is not only important for fishing and angling and the fishing access which is required, but it also important when water flow is appropriate for boulder hopping trips by local tramping clubs. Access along the Nevis therefore needs to be secured during tenure review.