Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land Tenure Review

Lease name : LAUDER

Lease number : PO 376

Conservation Resources Report - Part 1

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.

Note: Plans which form part of the Conservation Resources Report are published separately.

These documents are all released under the Official information Act 1982.

September 06

DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF

LAUDER PASTORAL LEASE (PAL 14-04-376)

UNDER PART 2 OF THE PASTORAL LAND ACT 1998

July 2006

TABLE OF CONTENTS

PART 1 INTRODUCTION 4

PART 2 INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE 5

2.1 Landscape 5

2.2 Landforms, Geology & Soils 10

2.3 Land Environments Of New Zealand 11

2.4 Climate 13

2.5 Vegetation 13

2.6 Fauna 19

2.6.1 Invertebrate Fauna 19
2.6.2 Herpetofauna 24
2.6.3 Avian Fauna 27
2.6.4 Aquatic Fauna 28
2.6.5 Problem Animals 29

2.7 Historic 29

2.8 Public Recreation 33

PART 3 OTHER RELEVANT MATTERS AND PLANS 36

3.1 Consultation 36

3.2 Regional Policy Statements & Plans 40

3.3 District Plans 41

3.4 Conservation Management Strategies & Plans 41

3.5 New Zealand Biodiversity Strategy 42

PART 4 ADDITIONAL INFORMATION 43

4.1 References 43

4.2 Illustrative Maps 45

4.3 Photographs 46

4.4 Appendices 47

PART 1 INTRODUCTION

The lessees of the Lauder Pastoral Lease (the lease) have applied to the Commissioner of Crown Lands for a review of land tenure. This report describes the inherent conservation values present on the lease.

Lauder is a moderately sized lease (4,255 ha) which lies at the northeast end of the Dunstan Mountains, Central Otago. The lease shares boundaries with the Lauder Basin Conservation Area to the northeast, Cluden lease to the northwest, Cambrian lease and Cambrian Hills lease to the east and the freehold Springburn property to the southwest. The lease spans an altitudinal range of approximately 1,000 m, from a 1,565 m high point along the main ridge crest of the Dunstan Mountains to below 500 m close to the junction between Loop Road and Lauder Station Road. Most of the lease lies above 1,000 m. The homestead and an associated cluster of historic farm buildings lie at the end of Lauder Station Road, the main access to the lease. The lease is approximately 4km by road from the St Bathans township and 40km from Ranfurly, the nearest commercial centre.

The lease lies within the Dunstan Ecological District (ED) for which a Protected Natural Area Programme (PNAP) survey has been completed (Grove, 1994). No recommended areas for protection (RAP's) were identified on the lease, however RAP A1 is located on Cambrian lease and some very small areas on the boundary of the RAP lie on the Lauder lease. The Lauder Basin Conservation Area adjoins the lease on the upper northeast and northwest boundaries.

The information in this report is based primarily on the findings of an assessment team of Department of Conservation specialists, who inspected the lease between January 16 and 19, 2006. Weather conditions during the survey period were varied. Cold, drizzly conditions were predominant experienced on January 16 and 18. Overcast skies cleared to sunny conditions by noon on both January 17 and 19. Overnight snow melted during the final day.

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

2.1 LANDSCAPE

Landscape Context

Within a wider landscape framework, the Dunstan Mountains are a large massif of fault-block mountains situated between the upper Clutha and Manuherikia Valleys. The southeast escarpment of these rangelands rises relatively abruptly from the Manuherikia Valley floor. On the corresponding northwest side, a series of long valleys and craggy spurs make deep incisions into the smooth, rounded topography that typifies the Dunstan Mountains' main ridgecrest. In the vicinity of the lease, a major lateral crest line forks from the main crest towards the south to form a large upland basin that contains the headwaters of the Lauder Creek. The lease boundaries extend into three main catchment areas including Donald Stuarts Creek towards the east, Woolshed Creek to the west and numerous small tributaries of Lauder Creek further to the north.

A typical cross section of the lease includes a high altitude ridgecrest, a large upland basin and a suite of gullies and spur lines, followed by a strip of foothills that fold gently into the Manuherikia Valley floor. In visual terms the steep slopes that overlook the Manuherikia Valley floor are a dominant local landmark and provide a visual focal point that can be viewed from the surrounding network of roads.

Survey Methods

The lease was inspected from various vantage points along Loop Road and from the access tracks on the lease. The inherent landscape values are indicated on Map 4.2.2. The lease has been divided into four landscape units based principally on water catchments. Each landscape unit is defined and a description of landscape character in terms of landform, land cover and land use given. An assessment of landscape values is made using the following criteria/attributes:

- Naturalness –an expression of the degree of indigenous content of the vegetative cover, and the extent of human intervention.
- Legibility –an expression of the clarity of the formative processes and how striking these physical processes are.
- Aesthetic values –includes the concepts of memorability and naturalness. Aesthetic factors that can make a particular landscape vivid include simplicity in landform, muted colours and fine textured ground cover.
- Visual values –a subset of landscape values which relate to the visibility of a particular landscape or natural feature seen from public vantage points such as district highways.

Landscape Unit 1

The elongated Landscape Unit One (LS1) occupies all the low lying front country on the lease. The upper limits to the unit are defined by the toe slopes of the rolling hill country that

bound the Dunstan Mountains. The lower boundary is physically defined by Loop Road which links Becks with St Bathans. Projecting from the hill country towards the valley floor are numerous flat-topped ridgelines with Woolshed Hill 556 m being the most prominent. A narrow ridgeline stretches down towards Loop Road and terminates at high point 467 m. The land that lies between the ridgelines is commonly low in physical relief and falls gently towards the Manuherikia River to the southeast. Woolshed Creek connects with Dunstan Creek outside the lease to form one of the main tributaries of the Manuherikia River. A low alluvial terrace runs parallel with Woolshed Creek. Some access to irrigation water is available in lower areas and several man-made ponds are scattered across the lease.

LU1 contains a strong cultural overlay with the low country being cultivated and converted into improved pasture. The ridgelines are commonly clad in introduced grasses. Areas difficult to develop occasionally contain small vestiges of silver tussock and a wide scattering of matagouri. The front country contains short rows of pine shelter belts. Crack willows line the lower section of Woolshed Creek.

The operational centre of the lease, including the homestead, covered yards and auxiliary buildings, is located at the end of Lauder Station Road. Many of the lease's farm buildings are historic in character, having been constructed from local materials during the 1860s.

Landscape Values

LU1 possesses moderate inherent landscape values owing to the extent by which the original ground cover has been converted into productive farmland. Small areas of short tussockland survive but in a landscape context these fragmented remnants are considered insignificant. The unit contains high landscape heritage values principally due to the intactness of the cluster of historic farm buildings. These reflect an early style in design and demonstrate skills and workmanship of a past era.

Potential Vulnerability to Change

This unit has the potential to be affected by inappropriate alterations and inappropriate "add-ons" to the cluster of historic farm buildings. These buildings are discussed further in the Historic section of this report.

Landscape Unit 2

Landscape Unit Two (LU2) includes the upper and mid section of the Woolshed Creek catchment. Just below high point 697 m the creek forks into two branches. The north branch is contained within a deep V-shaped gully that cuts into the flanks of the Dunstan Mountains. The head of this gully recedes to about 1,100 m. The neighbouring side gully contains the south branch of Woolshed Creek. This gully penetrates deeper into the Dunstan Mountains to an altitude of about 1,300 m. A narrow spur projects from the lateral ridgecrest of the Dunstan Mountains dividing the two side gullies. The upper slopes of the side gullies are typically rounded in form and are regularly indented by watercourses that feed directly into the creek's two branches. The mid slopes feature extensive blocks of rock outcropping with the occasional outlier of rock studded across the ground surface of the colluvial slopes. The channels for both branches are physically constricted by rock formations that frequently feature precipitous bluffs.

The vegetative composition is greatly influenced by aspect, altitude and pastoral farming practices. The sunnier upper side slopes, extending to about 1,100 m, are clad predominantly in short tussock grasslands. These comprise fescue tussock supplemented by introduced pasture grasses such as browntop and sweet vernal. Golden spaniard, matagouri and mingimingi are also present as is the occasional coral broom, normally located on the drier spur crests. Relic tall tussock grassland remains in places. Halls totara is widely distributed and usually situated near rock outcropping. Many of the larger rock outcrops are utilized by stock for camping and are circled by modified short grasslands. Regenerating manuka/kanuka shrublands form a wide band across both the darker and lower slopes of both side gullies, between 600-800 m.

Above 1,100 m the predominantly mixed short grasslands are replaced by narrow-leaved snow tussock. In general, the head catchment area of the south branch of Woolshed Creek possesses more intact tall grasslands. This is primarily due to the area's high altitude, ascending to over 1,300 m. The summit area between Woolshed Creek and Lauder Creek is characterized by flat pavement rocks and vertical shaft tors surrounded by patches of prostrate *Dracophyllum* shrublands.

Landscape Values

This unit has been divided into several segments. The mid and lower altitude country of both side gullies have moderate inherent landscape values. These are representative of a large portion of the lower flanks of the northern Dunstan Mountains where a wide zone of shrublands is progressively recolonising the slopes. The lower slopes within the mid section of the right branch of Woolshed Creek contain moderately high inherent landscape values attributable to the clear expression of the natural processes that have created the deep rocky channel. The margins of the creek typically convey a high degree of natural character. Above 1,100 m the unit possesses moderate-to-high inherent landscape values owing to the naturalness of the tall tussock grasslands. The landscape values tend to become more significant towards the head of the south branch of Woolshed Creek where the tall tussock is generally in better condition.

Potential Vulnerability to Change

This unit has the potential to be adversely affected by the following changes in land use and activities:

- Further loss of tall tussock grasslands, being replaced by tussocklands that are more modified and lower in stature.
- Further unnecessary earth disturbances that would allow the spread of opportunist species, such as hawkweed.
- Human intervention in the natural reversion of the mid and lower slopes into woody shrublands.
- Infestation by wilding pines.

<u>Landscape Unit 3</u>

Landscape Unit Three (LU3) encompasses a large portion of the upper catchment of Donald Stuarts Creek. The upper limits to the unit follow close to the 1,400 m contour, which lies immediately below the lateral ridgecrest of the Dunstan Mountains. The upper margins of

the unit lie on the boundary with the Lauder Basin Conservation Area. The lower boundary of the unit cuts across the mid slopes of the catchment.

The dominant landform of this unit is the shallow dish-like basin that overlooks the Manuherikia Valley. The physical relief is principally hummocky and the basin features expansive areas of earth and rock slumping. Deeply etched into the mantle of colluvium are straight watercourses that drain into the main channel of Donald Stuarts Creek. These small watercourses often originate from small finger bogs or alpine flushes perched within the mid slopes. Random blocks of parent rock protrude from the ground surface.

The unit is predominantly clad in narrow-leaved snow tussock. This extends down to the lower limits of the unit where more modified short grasslands begin to grade in. At a lower level, matagouri/mingimingi shrublands often border Donald Stuarts Creek. The unit is free of wilding pines.

Landscape Values

This unit conveys inherent landscape values due to the overall impression of the naturalness of the tall tussock grasslands. The upper area of the Donald Stuarts Creek catchment is widely visible from the Manuherikia Valley floor and dominates the highly visible southeast face of the Dunstan Mountains. A distinctive trait of LU3 is the extent and legibility of solifluction process, especially massive earth slumping.

Potential Vulnerability to Change

This unit has the potential to be adversely affected by the following changes in land use and activities:

- Further subdivision that would lead to artificial fragmentation of the existing uniform tall tussock.
- Further intensification of land use which would adversely affect the existing homogeneous attributes of the unit.
- Spread of wilding pines.
- Unsympathetic siting, colour and exterior finish of “built” structures.

Landscape Unit 4

Landscape Unit Four (LU4) incorporates a substantial portion of the upland basin of Lauder Creek. The basin is surrounded by the main ridge crest of the Dunstan Mountains and a major lateral spur that forks out towards the south.

The basin’s side slopes are typically hummocky and contain isolated areas of slumping. Principally, the drainage pattern is lightly superimposed with both permanent and ephemeral watercourses feeding into the Lauder Creek via indented depressions. Scattered rock outcrops jut from the colluvial mid slopes and vertical shaft tors stud the main ridgecrests. Smooth pavement areas are a notable feature of the ridgecrests. The most significant pavement area is along the ridge crest that forms the watershed between Lauder Creek and Woolshed Creek. The side slopes of the basin are broken periodically by substantial gullies. The upper sections of these gullies often display the imprint of periglacial processes such as scalloped hollows and areas of solifluction in the form of slumping and old earth flows.

Variation in the vegetative cover is subtle across the entire unit. Tall tussock grasslands dominate the colluvial side slopes. The composition of these grasslands is influenced by aspect. Darker slopes comprise undiversified snow tussock while corresponding drier sunnier slopes are covered in a mixture of narrow-leaved snow tussock, alpine fescue tussock, blue tussock and introduced grasses such as browntop. Silver mats of hawkweed are a common feature over the drier stony ridgelines. Grading into the narrow-leaved snow tussock close to the main ridgelines is a zone of slim snow tussock. Intermingled amongst the rock pavements along the ridgecrests are low cushions of *Raoulia*, prostrate *Dracophyllum* and tufts of blue tussock. The steeper rocky slopes that overlook the lower section of the Lauder Creek are widely clad in "grey" shrublands.

Landscape Values

Several features contribute to the high inherent landscape values in this unit. The unit is an integral component of a large coherent landscape that forms a continuum with the adjoining Lauder Conservation Area. The overall sense of naturalness and uniformity of the tall tussock grasslands is an impressive characteristic. Discrete areas have been modified due to the impact of concentrated grazing and stock camping. These affected areas do not compromise the overall high inherent landscape values due to the immense scale of the upland basin. Finally, the upland basin contains backcountry and remoteness qualities due to the absence of "built" elements. The disturbance areas associated with access tracking have successfully revegetated.

Potential Vulnerability to Change

This unit has the potential to be adversely affected by the following changes in land use and activities:

- Spread of wilding pines.
- Further subdivision that would lead to artificial fragmentation of existing uniform ground cover.
- Unsympathetic siting, colour and exterior finish of "built" structures, particularly close to the main ridgecrests.
- Unnecessary earth disturbances that allow weed species such as hawkweed to spread into previously uncontaminated areas.

LANDSCAPE VISUAL VALUES

Specific areas on the lease possess high visual resource value and make a positive contribution to the visual character of the Dunstan Mountains. Within a wider geographic context this also contributes to the landscape character of Central Otago. The northern Dunstan Mountains are frequently seen as a backdrop or visual setting in pictorial publications such as calendars.

The upper catchment area of Woolshed Creek (LU2) and the entire upper catchment area of Donald Stuarts Creek (LU3) are visually conspicuous from the network of local roads that criss-cross the Manuherikia Valley floor. These are also conspicuous from State Highway 85, especially in the vicinity of Becks. The upper Donald Stuarts Creek catchment is particularly conspicuous as it dominates much of the highly visible southeast face of the Dunstan Mountains. The lower flanks of the lease (LU1 and the lower section of LU2) have

less visual significance as these areas are viewed at a more acute angle, have few distinctive natural attributes and are often masked from view by shelter planting.

The upland basin (LU4) which encloses the headwaters of the Lauder Creek, is visually inaccessible from public viewing points. This visual inaccessibility helps to strengthen perceptions of the upland basin as being isolated and in a remote part of the high country.

SIGNIFICANCE OF LANDSCAPE

The lease makes a significant contribution to the recognizable landscape character of the whole of the Dunstan Mountains. Natural patterns generally dominate over the cultural overlay which includes extensive pastoral farming. In this wider context, the Dunstan Mountains are considered one of the iconic blocks of mountains that give Central Otago its distinctive range and basin landform pattern.

Within this broader physical framework a large portion of the lease (parts of LU2 and all of LU3 and LU4) is an important component of the overall landscape character of the Dunstan Mountains. In particular, the sense of uniformity of the tussock grasslands laid over similar geology combines to form a coherent high country landscape.

The lease is strategically located to help augment the special traits that are associated with the eastern high country's tussock grasslands. The lease is inextricably linked with other parcels of land, especially the Lauder Basin Conservation Area towards the north and east where there is a natural fusion in both ground cover and landform.

In contrast to the homogeneity and undiversified qualities of the tussock grasslands, is the repatriation of manuka/kanuka shrublands across the lower sections of both branches of the Woolshed Creek. The re-establishment of these "grey" shrublands appears to be a common occurrence along the lower flanks of the Dunstan Mountains.

The lease contains an outstanding cultural linkage with the high country in the form of a cluster of historic rural buildings that were constructed from local materials such as schist, and cob made from local clays.

2.2 LANDFORMS, GEOLOGY & SOILS

Landforms

The Dunstan Mountains are tilted block mountains of schist, situated between the upper Clutha and Manuherikia valleys. The eastern escarpment rises moderately steeply from the Manuherikia Basin.

The topography of the lease is varied and includes fellfield rocky zones on ridge tops, slumped faces, localised gorging, and stream flats with older terracing in the lower sections of Woolshed Creek. The lease includes catchment basins for Woolshed Creek, Donald Stuarts Creek and Lauder Creek.

Geology

The basement geology is well foliated quartzo-fledspathic schist and lesser chlorite schist of the Haast Schist Group. Frequent outcropping occurs (Mutch 1963).

Soils

The Land Environments of New Zealand (LENZ) dataset indicates the presence of N and Q environment soils on the lease (Map 4.2.7). In general, N environment soils are formed on alluvial sands and gravels derived from greywacke and schist, some of which are overlain with loess. They are generally moderately drained and of moderate natural fertility. Q environment soils are derived mainly from schist, greywacke and Tertiary rocks and extensive areas are mantled in loess. Substantial areas of alluvium, from these rocks, occur in the south. Other locally important parent materials include older basaltic and andesitic rocks and glacial till. Q Environment soils are generally moderately well-drained and are the most fertile of any montane environment.

Significance of Landforms, Geology and Soils

No significant soil sites have been identified on this lease as described in Arand *et al.* 1991.

2.3 LAND ENVIRONMENTS OF NEW ZEALAND

The environmental distinctiveness of this area has been assessed through the Land Environments of New Zealand (LENZ). This is a classification of New Zealand landscapes using a comprehensive set of climate, landform and soil variables chosen for their roles in driving geographic variation in biological patterns (Leathwick *et al.* 2003). It is presented at four levels of detail containing 20, 100, 200 or 500 environments nationally.

The data in this report is presented at Level IV. Level IV more adequately reflects the distribution of biodiversity, past clearance and current vulnerability across the landscape than higher levels of LENZ (e.g. level II). Threat classification at level IV results in substantially more effective and efficient identification of threatened remaining indigenous cover.

Overlaying the area of unprotected indigenous cover in threatened land environments, as identified in the national land cover database (LCDB), with Level IV LENZ information allows biodiversity values under most threat to be identified. Measures are provided for the percentage of biodiversity legally protected and percentage of remaining indigenous vegetation cover. Five threat categories identify environments containing indigenous biodiversity at most risk of loss. These are described in Table 1 below:

Table 1: Land Environments of New Zealand Threat Classification Categories.

Threat Classification	Description
Acutely threatened	<10% indigenous vegetation cover remaining
Chronically threatened	10-20% indigenous vegetation remaining
At risk	20-30% indigenous vegetation cover remaining
Critically underprotected	> 30% indigenous vegetation cover remaining and <10% protected
Underprotected	>30% indigenous vegetation cover remaining and 10-20% protected
No threat	>30% indigenous vegetation cover remaining and >20% protected

Attributing significance to LENZ units, while a useful exercise, must be treated with caution. Work is currently underway to improve the accuracy of underlying spatial data. Soil data, for example, is being upgraded. Currently, the median patch size for polygons sourced from the Land Resource Inventory is between 10,000 ha and 100,000 ha. However, at Level IV resolution, LENZ units cover areas as small as 10 ha. Improvement of the underlying classification process which generates LENZ units is ongoing.

The LENZ Q environment, the dominant environment of the mountains and hill country of the south-eastern South Island (Leathwick at al, 2003), is predominant on the lease. At Level IV classification most of the lease comprises the underprotected Q1.1c environment (51% of land area) and the critically underprotected Q2.2a (26.5%). Smaller areas of the acutely threatened N3.2a (7.8%), the not threatened Q1.1a (6.7%) , the acutely threatened N5.1b (2.9%) and the not threatened Q3.3a (2.1%) and Q 1.2a (1.5%) are present. Negligible amounts of the threatened alluvium plain type environments N5.1a, N3.1d and N4.1d, the hill environments Q1.1b, Q3.3b and Q3.3c are present on the lease. Table 2 presents a full LENZ analysis of the lease. Each each LENZ environment is described at Appendix One. Threat status is depicted on Map 4.2.7.

Table 2: Land Environments of New Zealand Environments Present on Lauder Pastoral Lease and Indigenous Vegetation Characteristics of Those Environments.

Threat classification	LENZ	Area on Lauder lease (ha)	% indigenous cover remaining	% protected	Change in indigenous cover 1997-2002
Acutely Threatened	N3.2a	334.16	1	7	No change
Acutely Threatened	N5.1a	20.88	1	3	No change
Acutely Threatened	N5.1b	125.82	1	1	No change
Chronically Threatened	N3.1d	2.26	1	14	Decrease
Chronically Threatened	N4.1d	1.01	3	19	No change
Critically Underprotected	Q1.1b	16.96	8	77	Decrease
Critically Underprotected	Q2.2a	1139.51	4	40	Decrease
Critically Underprotected	Q3.3b	17.47	1	81	Decrease
Underprotected	Q1.1c	2183.65	18	91	No change
Underprotected	Q3.3c	8.96	17	90	Decrease
No Threat Category >20% protected	Q1.1a	288.47	25	98	No change
No Threat Category >20% protected	Q1.2a	64.78	37	99	No change
No Threat Category >20% protected	Q3.3a	92.14	26	97	No change

Significance of Land Environments of New Zealand

Walker *et al.* (2005) describe a safety net of legal protection covering at least 20% of the original area as desirable to retain a full range of biodiversity (2005:9). Of the Level IV environments represented on the lease, the Environments Q1.1a, Q1.2a and Q3.3a have greater than 20% protection. Protection of the remaining eight LENZ environments falls short of this target.

2.4 CLIMATE

No specific climate data is available. The lease experiences a typical Central Otago climate with hot dry summers and cold winters. Considerable variation in annual rainfall and seasonal temperatures occurs. Based on data from nearby properties including the Mount St Bathans lease, even the lowest parts of the lease are likely to receive over 500mm of rain. More than 1200mm is likely to fall on the tops. Rainfall is generally heavier during the summer months however, due to high evapotranspiration rates, a soil moisture deficit usually exists. Frosts can be recorded at any time during the year and winters are cold with moderate to heavy frosts. Snow falls to low levels and generally lies on the ground for several days during winter.

Climatic information in the LENZ dataset describes the higher altitude Q environments as cool to cold. Generally moderate solar radiation, moderate vapour pressure deficits, low to moderate water balance ratios and slight to moderate annual water deficits are characteristic. Climatic conditions typical of the N environments along the Waihemo fault are cool to mild temperatures, low to moderate solar radiation, moderate vapour pressure deficits and moderate annual water deficits.

2.5 VEGETATION

Introduction

This section is based on information gathered during walk-through field inspections of the lease and from information held in the Department of Conservation BIOWEB database. The lease was divided into six survey areas. These are identified on Map 4.2.5.

The natural vegetation pattern of the lease has been altered to some degree by grazing and fire. Near-natural examples exist at elevations above c. 700m and below this level in gullies and on rocky sites. Seven broad vegetation zones are apparent on the lease. These communities intergrade to some extent and no readily apparent boundary is present between degraded exotic-dominated country and areas with more natural vegetation. The vegetation communities identified include:

- Bare rock fellfield, mainly located in the vicinity of the saddle.
- Cushionfield/short tussock grassland in patches along ridge crests.
- Widespread tussockland.
- Shrubland centred near streams and rocky sites.
- High elevation wetland along ridge crests and in impounded slumps.
- Exotic grassland with scattered terrace vegetation on flats.
- Snowbank communities.

Vegetation Descriptions

<u>Lauder Basin</u>

The Lauder Basin area encompasses the lease on both sides of Lauder Creek from the Dunstan Mountains ridge to the saddle.

Although predominantly covered by *Chionochloa rigida* tussockland, *Chionochloa macra* is also present above c. 1,200 m. This tussockland is in generally good condition although the cover is depleted on some open sunny faces. A diverse range of herb species are present in the tussock interstices, mainly *Anisotome aromatica, Aciphylla aurea, Epilobium* spp., *Geranium microphyllum, Viola cunninghamii* and *Wahlenbergia*. A high component of the hawkweeds *Hieracium pilosella* and *H. lepidulum* is present in some places. Lower elevations contain a higher component of prostrate shrubs such as *Pentachondra pumila, Leucopogon suaveolens* and *Pimelea oreophila.*

An area of fellfield around the saddle is exceptional in that a range of species, many threatened or at risk, are present. The fellfield includes one of few known sites of *Myosotis oreophila*, and healthy populations of *Myosotis* "glauca", *Cardamine* aff. *bilobata*, coral broom *Carmichaelia crassicaule*, dwarf broom *Carmichaelia vexillata* with *Schizeilema exiguum, Schizeilema hydrocotyloides, Dracophyllum muscoides, Stellaria gracilenta, Raoulia apicenigra*, and *Rytidosperma australe.*

Areas of cushionfield/short tussock grassland occur on the ridge crests. These are dominated by the prostrate shrubs *Dracophyllum muscoides* and *Dracophyllum pronum*, blue tussock *Poa colensoi* and the local alpine hard tussock *Festuca matthewsii* subsp. *pisamontis*. A diverse range of native herbs and grasses occur in these areas. Weed presence is very low. Scattered hawkweed *Hieracium pilosella* is present.

Higher elevation wetlands exist in a variety of forms in the upper parts of this area. On the broad ridge shoulders, seepage complexes can be extensive and contain a typical variety of subalpine wetland herbs, sedges and grasses including *Abrotanella caespitosa,* comb sedge *Oreobolus pectinatus, Gentianella grisebachii, Epilobium komarovianum, Carex gaudichaudiana* and *Euchiton lateralis*. These seeps are linear on the hill flanks. Where water is actively flowing, *Schoenus pauciflorus* and the sedge *Carex berggrenii* and buttercup *Ranunculus maculatus* are found. Sometimes these seeps are contained behind hill slumps creating rounded herb and sedge dominated wetlands. A tarn located midslope on the western face is a distinctive feature being unique to this site and unusual for the Ecological District. The distinctive species mix present is predominantly *Myriophyllum propinquum, Crassula sinclairii* and *Eleocharis acuta,* with cushion-forming wetland species such as comb sedge on the margin. A small population of the buttercup *Ranunculus brevis,* present in the shallow muddy margins, extends the southern limit of this species from the Falls Dam area. Also present is the herb *Gratiola sexdentata* which appears to have an uncommon distribution in Otago. This population is also unusual in that the normally black spots on the leaf margin were clear. Wetlands in this area are important as habitat for the annual *Gentianella lilliputiana.* This is only known from wetlands in the head basin of Lauder Creek and two other sites in South Canterbury. While not observed during this survey it was probably outside the time when this plant would have been visible.

Snowbank vegetation has developed in some areas behind slumps on the faces and is unusual in that it is dominated by mats of the small pincushion grass *Agrostis muscosus* and *Rytidosperma australe*.

Two bluff systems at the exit of tributary creeks into Lauder Creek were investigated. These contain characteristic bluff species such as *Helichrysum intermedium, Blechnum vulcanicum, Dracophyllum uniflorum,* mountain flax *Phormium cookianum, Hebe buchananii,* and *Celmisia brevifolia* with mountain totara *Podocarpus nivalis* (rare in the Ecological District)

and remnant shrublands of corokia *Corokia cotoneaster, Coprosma tayloriae,* matagouri, *Melicytus alpinus, Muehlenbeckia complexa,* bracken, *Rubus schmidelioides,* and *Coprosma propinqua.* Populations of the chronically threatened *Pachycladon cheesemanii* and at risk *Myosotis* "small white" are present under overhangs. Scree slopes contain the *Kirkianella novae-zelandiae, Vittadinia australis* and one population of the *Myosotis* "glauca". Above the bluff systems the catchments are tussock dominated with colonising species such as *Epilobium melanocaulon* and *Raoulia* spp. present on recent gravels and occasional populations of coral broom present on banks.

An extensive area of shrubland exists in the lower reaches of Lauder Creek. This is dominated by *C. propinqua, M. alpinus, M.complexa* and matagouri, with occasional *R. schmidelioides, Olearia odorata, Carmichaelia petriei, Clematis marata, Aristotelia fruitcosa,* briar and rowan. A large tree daisy *Olearia fimbriata* is present in this area.

Donald Stuarts and Woolshed Creek headbasins

This area is dominated by slim snow tussock *C. macra* above 1,200 m. Tussock cover is dense on shady aspects and more open on sunny faces and the main dividing spur which have a greater density of *A.aurea,* the hawkweeds *H. pilosella* and *H. lepidulum* and exotic grasses. Coverage and general condition of the tussockland appears to decline below the contour fence at c.1,000 m. Inter-tussock herb diversity is good.

Some intact snowbank, seep and flush wetlands are present. A particularly good seep wetland complex exists in the Woolshed Creek headbasin. This headbasin seems to have higher plant diversity and to be in better condition than the Donald Stuarts Creek headbasin. This is also the only site where *Hebe lycopodioides* was seen on the lease. The lower reaches of Donald Stuarts Creek, while not visited, appear to contain shrubland probably dominated by *C. propinqua* and matagouri. Another area of wetlands occurs in the far corner of the Donald Stuarts Creek basin. This is expected to have the same values as for those on the adjoining Cambrian PL where a small wetland on a flat to gentle ridge at approximately 1,100 m. in the northeast corner of the lease, supports virtually pure cover of *Oreobolus pectinatus* (comb sedge). Numerous insectivorous *Drosera arcturi* (sundew) are scattered throughout the wetlands and *Carex gaudichaudiana, Gnaphalium spp, Coprosma perpusilla* and *Sphagnum* moss vegetate the margins.

Woolshed Creek streams, faces and spurs

A notable feature of the two branches of this creek is the extensive areas of kanuka shrubland which extend a considerable distance up the sunny faces and spurs.

In the south branch an extensive area of shrubland is dominated by matagouri, *C. propinqua* and *O. odorata* with occasional *M. complexa, Aristotelia fruticosa,* elder and gooseberry. A good population of the tree daisy *Olearia lineata* is present on the terraces and feeder streams. The north branch also contains extensive dense shrubland but *O. odorata, O. lineata* and *A. fruticosa* are absent. Rock outcrops along the lower faces and by the stream harbour many herbs and ferns including *Pellaea calidirupium, Asplenium flaccidum, Asplenium hookerianum, Acaena anserinifolia, Acaena juvenca, Carex comans* and *Dichondra repens.*

Faces in this area are dominated by tussock or short tussock grassland with areas of matagouri, *C. petriei* and *C. propinqua* shrublands present in gullies and around outcrops.

Exotic grasses and *H. pilosella* become extensive at lower elevations. A wetland area on the eastern face contains a healthy population of the speargrass *Aciphylla subflabellata*.

Spur crests contain scattered populations of coral broom and shrubland dominated by matagouri, *C. petriei, M. complexa, M. alpinus, C. propinqua* with rarer Corokia and *O. odorata.* A Halls totara is present on the western spur. Other areas are dominated by tussock or short tussock grassland. Exotic grasses and *H. pilosella* become extensive at lower elevations.

Terraces and flats are dominated by exotic grasses and herbs with scattered *Muehlenbeckia axillaris* and two patches of the sedge *Carex kaloides* noted. Recent gravel flats contain colonising herbs such as *Raoulia tenericaulis* and the sedge *Carex petriei*.

The pond in the old coal extraction pit contains the native pondweed *Potamogeton cheesemanii* and the sedge *Eleocharis acuta.* This area is dominated by exotic herbs.

Flats

The alluvial terraces along the lower reaches of Woolshed Creek have either been cultivated or are dominated by exotic pasture. An area of gold mining tailings contains scattered populations of native species including *M. axillaris, Acaena inermis, Raoulia australis, Geranium sessiliflorum* and *Wahlenbergia albomarginata.*

Significance of Vegetation

The lease contains representation of the plants and plant communities in the montane, sub-alpine, low alpine and high alpine bioclimatic zones. Of the native vascular plant species present, at least 15 species are listed as threatened and a further two as Data Deficient in the most recent threat classification system (Hitchmough 2002 as amended by de Lange 2004). A list of these species with their threat of extinction status and distribution within the lease is provided below in Table 3 and Map 4.2.5. A further six species are Regionally Significant as these are uncommon in Otago, or Locally Notable as these are uncommon this area.

Of highest significance is the occurrence of healthy populations of the forget-me-not *Myosotis* "glauca" (Endangered) on Lauder Saddle and scattered populations in tributaries of Lauder Creek. Taxa in this category are facing a very high risk of extinction in the wild (Molloy *et al.* 2002). The species qualifies as Endangered because the best available knowledge suggests that there are less than 250 plants known, occupying a combined area of < 1 ha.

Species listed in the categories Serious Decline and Gradual Decline fall within the division 'Chronically Threatened'. Species in this division face extinction but are buffered slightly by either a large total population size, or a slow decline rate. Species listed as Sparse and Range Restricted fall under the division "At Risk". Although they are not currently in decline, their population characteristics mean a new threat could rapidly deplete their populations. Sparse taxa have very small, widely scattered populations. Species listed as Data Deficient have insufficient information on which to make an assessment as to their appropriate category.

Six species, although not ranked as nationally threatened, are uncommon in Otago (Regionally Significant) or uncommon in this area but reasonably common in the rest of Otago (Locally Notable). Large populations of kanuka *Kunzea ericoides* are present in Woolshed Creek. Intact shrublands of this species are rare in the Ecological District. The wetland herb *Gratiola sexdentata* is present in the tarn and one population of the daisy *Senecio* "discoideus" is present on a bluff in Lauder Creek. These species appear to be uncommon in Otago. The forget-me-not *Myosotis* "drucei", a population of which is present at the base of a tor on the ridge crest of Lauder Basin and the forget-me-not *Mysosotis elderi*, two populations of which are present in fellfield of the Lauder Basin, are species uncommon in Central Otago. Healthy populations of the snow totara *Podocarpus nivalis* are present on steep slopes near bluffs by Lauder Creek. The snow totara is uncommon on the mountains of Central Otago.

High alpine and low alpine communities (fellfield, snow banks and tarn vegetation) are significant as distinctive communities, and for their contribution to contiguous larger areas of these communities. The fellfield community around the saddle is unique to this area of the Dunstan Mountains, the prostrate grass snowbank vegetation is unusual and the tarn vegetation association is very rare within the Ecological District and in Central Otago.

Small alpine wetlands in Donald Stuarts Creek and Woolshed Creek head basins are expected to have similar values to those on the adjacent Cambrian Hills. Generally the wetlands at similar altitude on Cambrian Hills are in exceptional condition and despite limited extent are considered to be of high conservation value. Whilst similar areas exist at higher altitude on the Dunstan Mountains, there are few examples at this relatively low altitude (~1,100 m).

Extensive tall tussock grasslands comprising *Chionocloa macra* and *C. rigida* are present in the Lauder Basin and above c. 1,200m in the Dunstan Mountains. This is one of the largest areas of intact tall tussock cover in Central Otago. *C. macra* was once more common on the crests of Central Otago block mouintains, but has undergone substantial retreat following pastoralism.

Table 3 Lauder Pastoral Lease Threatened and Data Deficient Plant Species

Threat Division	Threat Category	Species	Location on lease
Acutely threatened	Endangered	forget-me-not *Myosotis* "glauca"	Healthy population in saddle. Scattered populations in tributaries of Lauder Creek.
Chronically threatened	Serious Decline	dwarf broom *Carmichaelia vexillata*	Two healthy populations at the saddle.
		tree daisy *Olearia fimbriata*	One large tree in lower reaches of Lauder Creek.
	Gradual Decline	coral broom *Carmichaelia crassicaule*	Scattered populations along streams and faces in Lauder Basin, the saddle, and on spurs above Woolshed Creek (where often heavily browsed).
		cress *Pachycladon cheesemanii*	Small populations in overhangs and crevices in bluffs near Lauder Creek.
At Risk	Range Restricted	forget-me-not *Myosotis oreophila*	Large healthy population at the saddle.
		hard tussock *Festuca matthewsii* subsp. *pisamontis*	Large healthy populations in cushionfield and short tussock grassland along ridge crests of Lauder Creek basin.
		buttercup *Ranunculus brevis*	Small population in tarn in Lauder Creek basin.
	Sparse	narrow-leaved tree daisy *Olearia lineata*	Healthy population in southern tributary of Woolshed Creek.
		speargrass *Aciphylla subflabellata*	Healthy population in wetland above northern branch of Woolshed Creek.
		daisy *Kirkianella novae-zelandiae*	Rare on scree slopes of Lauder Basin.
		forget-me-not *Myosotis* "small white"	Small populations in overhangs in bluffs of tributaries to Lauder Creek.
		buttercup *Ranunculus maculatus*	Healthy populations in wetlands of basins.
		hookgrass *Uncinia viridis*	Small populations in overhangs of bluffs by Lauder Creek.
		sedge *Carex berggrenii*	Healthy populations in seepages of Lauder Creek basin.
	Data Deficient	cress *Cardamine* aff. *bilobata*	Small population on tor at the saddle and in crevices of bluffs near Lauder Creek.
		fuzzweed *Vittadinia australis*	Small populations in dry rocky sites of Lauder Creek and Woolshed Creek.

Problem Plants

Hawkweed (*Hieracium pilosella* and *H. lepidulum*) are common in tussock grassland at lower elevations. Above c. 1000 m their impact appears limited. Orange hawkweed *Hieracium aurantiacum* is present as a small patch near the saddle fellfield and king devil *Hieracium praeltum* is present in localised areas of lowland Lauder Creek basin.

A single plant of Himalayan honeysuckle is present on a bluff in the Lauder Creek. This species has the potential to spread and dominate shrubland margins. Briar and elder are a frequent component of the shrublands at lower elevations. Lombardy poplar, present in the

lower Woolshed Creek, is spreading into the surrounding shrubland. Broom and gorse are common on terrace risers along the flats.

2.6 FAUNA

2.6.1 Invertebrate Fauna

This section contains area and habitat descriptions and an annotated inventory of invertebrates collected or noted during the inspection.

The lease supports a range of ecological habitats including tussock, shrubland, wetland, streams and scree. The majority of the lease lies above 1,000 m and several areas support invertebrates which are adapted to a desiccating environment of freeze-thaw cycles and high winds.

Previous invertebrate surveys of the north Dunstan Mountains include a substantial moth inventory by Patrick (1994), the tenure review survey of the adjacent Cambrian Hills lease (Chinn 2005) and as part of the PNAP Survey for the ED (Grove 1994).

Survey Methods

Invertebrates were collected by hand while searching beneath rocks and logs, aspirating and sweeping vegetation. Pitfall and yellow pan traps were installed overnight. Collecting effort was targeted towards endemic taxa of the following groups; Arachnids (spiders and harvestmen), beetles, orthopteroids (grasshoppers, weta and cockroaches) and myriapods (millipedes and centipedes). Species within these taxonomic groups often display local endemism, flightlessness and are taxonomically familiar to the collection team. In addition, these taxonomic groups tend to include numerous threatened species.

Invertebrates were collected from spot sites identified on Map 4.2.4. These were chosen to maximise altitudinal range, diversity of native vegetation and accessibility. Identified taxa were assessed and species of interest were cross-checked against the national threatened species lists (McGuinness 2001 and Hitchmough 2002). Habitat descriptions follow those of Atkinson (1985).

A number of caveats exist with regard to this type of survey. First, the time available to collect specimens is limited and therefore the inspection represents a ‘snap-shot’ in ecological time. Second, the primary aim of tenure review surveys is to locate and identify species of conservation significance and important habitat, not to produce an exhaustive list of common or introduced species. Third, the field program logistics meant a number of collection methods have been omitted from the survey.

Invertebrate and Invertebrate Habitat Descriptions

<u>Dunstan Mountains summit true right Lauder Creek - Map 4.2.4 Area A sites 1, 2, 3,25,26,27</u>

This large south facing block includes the Dunstan Mountains summit ridge, the highest point on the lease, and three significant drainage catchments. The dominant community structure on these slopes includes snow tussock (*Chionochloa macra*), *Dracophyllum*

pronum, speargrass (*Aciphylla aurea*) and the mountain daisy *Celmisia* sp. Both *A. aurea* and *Celmisia* sp. occur in high densities across the summit ridge and are characteristic of historical burning and long-term grazing.

The series of fault scarps and slumps throughout the mid-slopes provide water traps. Small tarns and wet flushes are maintained by seepage and snowmelt in these areas. These wet habitats are in marked contrast to the surrounding community and support a diverse range of invertebrates.

The invertebrate fauna within this area is dominated by native and regionally endemic taxa, a number of which are of conservation interest. At sites 1 and 2 for example, the relatively large, speargrass weevil *Inophloeus sulcifer* was collected from *A. aurea*. These weevils are slow moving and easy prey for rats and mice. Their only means of defence is to freeze and drop into the tiller bases of the host plant. The endemic Otago ground beetle *Mecodema impressum* was collected at site 27, a cataract stream with woody riparian vegetation. These beetles are moderately widespread and very similar to *M. lucidum*, also an Otago species found on the lease.

A species of darkling beetle (*Artystona vicina*) is present throughout this area. This beetle is often found clustered beneath the loose rocks and stones associated with tors and outcrops where they feed on fungi, mosses and lichen. *Artystona* sp. beetles display a number of interesting biological features which lend the group to scientific study. In many cases beetle populations are isolated from each other either ecologically or physically. This can promote genetic variants and sub-species. These beetles are tolerant of extremes in temperature and humidity and are of scientific value.

Day-flying *Geometrid* moth species collected from Area A include; *Notoreas chioneres, Asaphodes declarata* and *Paranotoreas brephosata*. These attractively coloured moths are obligate feeders of native herbs and forbs with several species showing regional endemism. The ‘Dandy’ moth (*Notoreas chioneres*) is an Otago endemic for which the type specimen was collected from the Old Man Range. Caterpillars of *N. chioneres*, which probably feed on *Pimelea*, are present in tall tussock at Site 27. The caterpillars of the striped carpet moth (*Asaphodes declarata*) feed on *Ranunculus* and the orange underwing moth (*Paranotoreas brephosata*), is an eastern South Island endemic whose larvae feed on low growing plants including the dwarf alpine daisy *Brachyglottis* sp.

Also present at Site 27 is the Acrocerid fly, *Ogcodes brunneus*, one of 10 native ‘bladder flies’ in New Zealand. The unusually bulbous-looking adults lay eggs on grass and twigs, the hatched larvae then parasitise native spiders. The only common native spiders observed at the site are species of *Clubiona* and *Miturga*, both nocturnal hunting spiders.

Inspection of a tarn at Site 25 for fresh water invertebrates produced a suite of native taxa. Of note were the common water boatman (*Sigara arguta*), small diving beetles (*Liodessus plicatus*) and abundant Copepods Crustacea. Damselflies (*Xanthocnemis zealandica*) and numerous root gnats (*Sciridae*) are present amongst tussocks near the water’s edge. This particular tarn and other similar bodies of fresh water seen in the area appear permanent, and are therefore ecologically stable.

West-facing slopes, true left of Lauder Creek - Map 4.2.4 Area B sites 6 -14 and 28, 29

Invertebrate habitats within this area are more diverse than for Area A and include; shrubland, tussock, aquatic, rock tor, scree and the sub-alpine schist pavements. These are a characteristic feature of Otago block mountain summits. Two prominent water catchments are present; Lauder Creek and an unnamed tributary which flows northwest into Lauder Creek. Each supports a down-stream riparian strip of woody shrubland. The riparian vegetation includes, but is not restricted to, matagouri, *Coprosma propinqua* and *Olearia* spp. Elsewhere the area comprises slopes of tussock grassland with *Aciphylla aurea* and *Celmisia* sp.

The threatened spider *Matua valida* is present at collecting sites 10 and 14. This species is currently found mainly in Canterbury and in Central Otago where collection records include Alexandra, Cromwell, Dunstan Downs, Cardrona Valley and Lakes Hawea and Wanaka. This find together with a specimen recently collected during the Cambrian Hills tenure review inspection (Chinn 2005), confirms the spider's presence on the Dunstan Mountains. *Matua valida* is an endemic Gnaphosid (the 'stealthy spiders'), which hunt at night by slowly creeping up on their prey. The spiders live within silken retreats found under stones and bark. The specimens found on this inspection were beneath loose stones.

Site 10 also produced a suite of native invertebrates which are characteristic of riparian habitats of the eastern high country. The giant dragonfly *Uropetala chiltoni* and the native black stonefly (*Austroperla cyrene*), for example, are two insects which depend on flowing water for part of their life cycle. Both are common in this area. Other interesting insects included the endemic Otago cicada *Maoricicada otagoensis* present on tall tussock at site 10, and a number of striped carpet moth *Asaphodes declarata*.

Endemic beetles are well represented within this area. Numerous carabids (*Mecodema lucidum*) are present at sites 11 and 28, speargrass weevils (*Inophloeus sulcifer*) and flower beetles (*Dasytes* sp.: *Melyridae*), the latter of which were collected from Celmisia florets. Darkling beetles (*Artystona vicina*) are also frequent at sites 28 and 29. With the exception of the flower beetles, each of these beetle species present are associated with habitats that appear to be protected to some degree from grazing and fire.

A scattered population of the large mountain stone weta (*Hemideina maori*) is present at site 6 (1,400 m). These nocturnally active weta tend to congregate beneath schist slabs which form stone pavements. Although not threatened, *Hemideina maori* requires a relatively undisturbed habitat given that individual weta can live up to seven years within their mating dens. Such longevity is promoted by their slow metabolic rates, freeze tolerant physiology and omnivorous feeding habits.

Also of note at site 6 are small Bhyrrid moss beetles (*Liochoris* sp). Little information exists about these spherically shaped, metallic green beetles although experience suggests they are restricted to sub-alpine conditions and can cope with freeze-thaw cycles.

The greatest threat posed to the habitat of site 6 is likely to be motor vehicles and damage due to road maintenance and/or construction.

Left and right branches of Woolshed Creek - Map 4.2.4 Area C sites 4, 5, 15-23

Sites 4 and 5, which both lie above 1,200 m, contain a fully endemic insect fauna. The Otago mountain cockroach *Celatoblatta quinquemaculata* is abundant where found and moss beetles (*Liochoria* sp.) are common beneath stones at site 4. Pitfall traps at site 5 collected an Otago wolf spider *Anoteropsis flavescens*, a ground beetle *Mecodema lucidum* and *Miturgid* prowling spiders. Tussock butterflies (*Lycaena salustius*) are also common which reflects the relatively intact condition of the alpine tussock above the 1,000 m contour.

The true left and right branches of Woolshed creek each support extensive woody shrublands comprised largely of Kanuka (*Kunzea ericoides*), *Olearia odorata* (also *O. lineata*), *Coprosma propinqua*, *Muehlenbeckia complexa*, and matagouri (*Discaria toumatou*). Dense Kanuka occurs on the northeast faces of each catchment while more shade tolerant species are present on south faces and at the confluence of the two creeks. These shrublands support an abundance of native invertebrates which represent various trophic-guilds including; pollinators, herbivores, detritivores, decomposers and predators.

The spider *Dolomedes aquaticus* (Data Deficient) is the only threatened invertebrate species observed at site 16. The spider is present within the creek bed of the true right branch of Woolshed Creek. Although widespread, little is known about the biology of this spider. Recently the species has been the subject of a study at Cass, Canterbury (Greenwoood 2004). Greenwood found that peak population abundance of *D. aquaticus* occurs near rivers with an intermediate level of flooding. By contrast, spider populations associated with infrequently flooding streams are influenced more by surrounding habitat composition (Greenwoood 2004).

The sampling area also produced a range of taxonomically interesting native beetles. The small endemic *Holcaspis implica* is present at site 16 (creek bed habitat) and the larger, smooth-surfaced *Oregus aereus*, is present at site 20 (grazed tussock/ grasslands). *Holcaspis implica* is part of a species complex and is restricted to Canterbury and Otago. The common manual beetle (*Pyronota festiva*) is abundant on flowering Kanuka and a single chafer beetle (*Odontria* sp. probably *O. striata*) is present in wetland grasses and sedges growing alongside an artificial reservoir at site 15.

At least two species of crane fly (Tipulidae) are abundant throughout both creeks. Recognisable taxa included a species of giant crane fly (*Austrotipula* sp.) and the smaller *Leptotarsus* sp. The larvae of this species feed on rotting vegetable matter associated with ponds and streams. Copper butterflies, whose larvae are feeding on *Muehlenbeckia complexa*, are frequent, as are hoverflies (Syrphidae) which feed on pollen.

Site 24 at the sarsen stone gold-tailings, is the least ecologically natural site inspected. Regardless, various native invertebrates are present including crickets (*Bobilla* sp.), common lowland grasshoppers (*Phaulacridium marginale*), damselflies (*Xanthocnemis zealandica*) and wolf spiders (*Anoteropsis hilaris*).

Headwaters of Donald Stuarts Creek - Map 4.2.4 Area D site 30

Five species of endemic day-flying moth were collected during two visits into this high catchment. The identified species include; *Aponotoreas insignis, Asaphodes declarata, Dasyuris anceps, Notoreas chioneres*, and *Paranotoreas brephosata*. The larvae of these

moths depend on native host plants, most of which are restricted to sub-alpine tall tussock environments, as occurs throughout this cirque basin. Several other insects are present which are characteristic of the habitat. These include the common alpine grasshopper (*Sigaus australis*) and the Otago endemic cicada (*Maoricicada otagoensis*).

Significance of Invertebrate Fauna

Species of conservation interest observed on the lease are identified in Table 4 below. Threat status, where relevant, is from Hitchmough (2002)

Table 4 Lauder Pastoral Lease Species of Conservation Interest January 2006

Taxon	Status	Site, Location and distribution on lease
Matua valida Forster & Blest	Data Deficient	Site 10 (E2244009 N5586822 1,000m) Site 14 (2247859 N5581753 844m)
Dolomedes aquaticus Goyen	Data Deficient	Site 16 (E2249332 N5582146 532m)
Mecodema impressum Laporte de Castelnauu	A moderately widespread and common endemic Central Otago species (Johns 2005)	Site 11 (E2243400 N5586451 904m) Site 27 (E2243357 N5588115 1,128m)
Neoferonia edax Chaudoir	An Otago endemic, restricted to montane environments (Johns 2005; Larochelle and Larivière 2001)	Site 27 (E2243357 N5588115 1,128m)
Inophloeus sulcifer Broun	Endemic speargrass weevil. Susceptible to predation by rats and mice.	Site 1 (E2241201 N5588356 1,557m) Site 2 (E2242457 N5589385 1,479m)
Notoreas chioneres Prout	Otago endemic, type specimen ex. Old Man Range, CO. Caterpillars may feed on *Pimelea*.	Site 27 (E2243357 N5588115 1,128m) Site 30 (E2246421 N5585905 1,355m)
Dasyuris anceps Butler	Greater orange underwing. Caterpillars feed on *Aciphylla* and *Gingidia.*	Site 30 (E2246421 N5585905 1,355m)
Hemideina maori Pictet & Saussure	Endemic mountain stone weta. These large weta require undisturbed sub-alpine stony habitats.	Site 6 (E2245304 N5585182 1,363m)

Of the five classes, 18 orders, 51 families and 84 species of invertebrate identified on the lease, two species are listed as Data Deficient. None of the species found is fully protected. Collectively, the make-up of the identified species is regionally significant. The high altitude grasshoppers, weta, cockroaches, beetles and day-flying moths present on the lease are distinctly Central Otago in character. Furthermore, the Dunstan Mountains are high and ecologically isolated from the neighbouring block mountains, a feature which has scientific value. High altitude species such as the weta *Hemideina maori*, for example, can provide valuable information on local speciation patterns and comparative physiological studies. As a consequence, much of the higher elevation invertebrate habitat of the Lease has significance.

Threats to Invertebrate Populations

Known predators of invertebrates include; possums, hedgehogs, rats, mice, stoats, cats and birds. Evidence of possums and rats is present at a number of the invertebrate sampling sites. Goats are present in high numbers on both sides of Lauder Creek and may have an indirect, competitive effect on invertebrates through host plant browsing.

2.6.2 Herpetofauna

"Site locations of rare and endagered herpetofauna are recorded in the original report. Herpetofauna of this nature is at risk of illegal activities including damage and removal through unlawful interference and disturbance. Accordingly, information regarding the locations of any such herpetofauna has been deleted from this version of the report. The Department of Conservation has put in place mecanisms to ensure that such information can be released for genuine scientific and research purposes. Please contact the Department of Conservation directly to determine whether the information can be released."

Introduction

Five of the six lizard species currently known from the Dunstan ED (Whitaker 2002) are present in this area, having been observed on the adjacent Cambrian Hills lease in 2005. The high altitude forest gecko (likely to be *Hoplodactylu*s aff. *granulatus* "Roy's Peak") has been found on the boundary between the Dunstan and Lindis ED's and in the south Dunstan Mountains (T. Murdoch, pers. comm.). Suitable habitat exists on the lease and these rare geckos may be present on the lease.

The lease was divided into six areas for the purpose of this survey. These are identified on Map 4.2.3. Each area is discussed below. Within those areas targeted search areas included rock tors and associated talus slopes, and vegetated boulder fields. These are known to be suitable habitats for the chronically threatened species *H.* aff. *maculatus* "Otago/Southland large" and *O. chloronoton*. Habitat for Roys Peak geckos (*Hoplodactylus* aff. *granulatus* Roys Peak) is not yet well understood but is known to include tussock and rock fields with associated rock tors above 1,200 m which provide deep, dry retreats (Jewell, pers. comm.). McCann's skinks (*O. maccani)* are common at all altitudes up to 1,480 m.

Survey Methods

Weather during the survey period was generally unfavourable for lizard basking and so searching was mainly conducted by looking in rock crevices and lifting rocks. The lizard search was conducted primarily by one person. Two additional people were able to contribute, capturing lizards when rocks were turned to look for invertebrates. Unsuitable weather conditions meant night searches targeting suitable habitat for Roys Peak geckos were not able to be conducted. Day time searches for geckos on high altitude tors were also hampered by high winds, as under these conditions geckos are more likely to be deep in crevices and rock stacks and are unavailable for capture. All observations of sloughed skin,

skeletal remains and large lizard scat were recorded.

Species Habitat and Distribution

Lauder Creek head basin - Area 1

A search was undertaken in a gully and at three high altitude sites. A confirmed population of the green skink *O. chloronoton* is present near the western boundary fence. A single adult green skink, observed in a sheltered position among large schist boulders, was basking in sunny morning conditions in a boulderfield containing patches of snow from the night before. This population is only the fourth record for the species in the Dunstan Mountains. Habitat suitable for *O. chloronoton* is also present along the northern faces of steep cliffs and gullies above Lauder Creek. “Otago/Southland large” geckos are common under rocks in the gully and are sympatric with Cromwell geckos (*H.* aff. *maculatus* “Cromwell”).

Unnamed tributary centred on Lauder Creek - Area 2

Despite initially poor weather conditions, “Otago/Southland large” geckos are present under streamside rocks and also on rock tors on either side of the tributary down to where it intersects with Lauder Creek. A putative sighting of a green skink on January 16 was not confirmed, but habitat suitable for *O. chloronoton* is located along the northwest faces of the steep cliffs and gullies above Lauder Creek. Two juvenile common geckos (*H. maculatus* sp.) under rocks on a tor were too small (< 35mm Snout Vent Length (SVL)) to be fully identified. Pink mouth colour suggests they are not Roys Peak geckos, although high altitude tors in this area provide potential habitat for this rare species.

Head basin of right branch of Woolshed Creek – Area 3

A search of three tors near the western fenceline of this area did not locate any lizards. Weather conditions were again unsuited to lizard activity. A single female “Otago/Southland large” gecko was present under a rock slab on the eastern face. Heavy grazing and stock damage to the tors with nearly all loose rock having been knocked off, has greatly reduced the habitat value for lizards.

Head basin of Donald Stuarts Creek - Area 4

McCann's skinks are common on the northwest face of this head basin above 1,100 m where scattered, loose rock and high quality tussock provides plenty of skink habitat. Tors lower on the southeast face of the basin while not searched are likely to contain resident geckos.

South and north branches of Woolshed Creek - Area 5

Cold and drizzly conditions during the search were unsuited to lizard activity. Two individuals of the gecko “Otago/Southland large” were observed under scattered rocks in pasture at 600 m in the south branch of Woolshed Creek and also on a tor next to the southeast boundary. "Cromwell" geckos are also present on tors on the true right above the north branch. Two adult "Cromwell" males (64 mm and 60 mm SVL) were found sharing a rock with a juvenile (39 mm SVL). Up the north branch of Woolshed Creek, very little rock is visible under the scrub on the true left, whereas many rocky outcrops and associated rock piles are present on the true right. Despite the cool weather conditions, *H. maculatus* sp.

geckos were seen in deep crevices, and sloughed skins and scats were commonly seen. Many of the tors on the less steep slopes have been damaged by stock, with very few loose rocks remaining and close grazing of the surrounding grass.

Tailings north of Lauder Station Road - Area 6

Three artificial stone banks in this area had plentiful lizard scat, but no lizards were seen during two afternoon searches. Scat size is consistent with small-bodied skinks and the rock piles are deep enough to provide ample refuge.

Species Present

The four lizard species present on the lease during this survey are identified in Table 5 below which provides information on distribution and a summary of threat status. Individual lizard sightings are detailed at Appendix 4.

Table 5 Lauder Pastoral Lease Lizard Sightings January 2006

Species name	**Threat status**	**Distribution on Lauder PL**
Oligosoma chloronoton	Gradual Decline	Lauder Creek head basin (Area 1) putative sighting near Lauder Creek in Area 2.
Hoplodactylus aff. *maculatus* "Otago/Southland large"	Gradual Decline	Lauder Creek head basin (Area 1) Area 2 tributary Woolshed Creek right branch
Hoplodactylus aff. *maculatus* "Cromwell"	Not Threatened	Lauder Creek head basin (Area 1), Tors on true right of left branch of Woolshed Creek
Oligosoma maccani	Not Threatened	Ubiquitous on lease

Threats to Lizard Populations

Predation and habitat modification represent the greatest threats to herpetofaunal values. The lizard populations on the lease are likely to be subject to predation by the full range of introduced mammalian predators common to mainland New Zealand. Sign seen during this survey included feral cats, pigs and hedgehogs. Mustelids and rodents will also be present. Habitat disturbance from rock heaving during pig rooting, trampling and fouling of tors by ungulates and associated herbivory of rock tor vegetation are also significant threats to lizard populations. Rocks freshly displaced by cattle are common in Area 5 and some tors in Area 1 and 3 are impacted by stock camps.

Significance of Herpetofauna

Both *Oligosoma chloronoton* and *Hoplodactylus* aff. *maculatus* “Otago/Southland large" have a threat rank of Gradual Decline (Hitchmough, 2004). The Otago Conservation Management Strategy (CMS) ranks these lizards as being in moderate need of conservation within the Otago Conservancy. Management objectives within the CMS identify the need “to ensure the continued survival of populations at sites that secure the full geographic range and which are representative of each recognised genotype” (Whitaker *et al.* 2002).

Suitable habitat for *Hoplodactylus* aff. *granulatus* “Roy's Peak” is believed to be present in

Area 1and 2 based on the currently limited understanding of the habitat requirements. These geckos are notoriously difficult to find even in sites where they are reasonably abundant (Tocher and Marshall, 2001) and no lizards were observed in this survey. Understanding of suitable habitat is also limited. This species has a threat ranking of Acutely Threatened and is ranked in Otago Conservancy as in "high" need of conservation attention (Whitaker *et al.* 2002).

McCann's skinks and the Cromwell gecko are common throughout the Dunstan ED and beyond, are ranked Not Threatened (Hitchmough 2002) and of "low" conservation status in Otago (Whitaker *et al.* 2002). However, the sympatry of *Oligosoma chloronoton, O. maccani, Hoplodactylus* aff. *maculatus* "Otago/Southland large" and *H.* aff. *maculatus* "Cromwell" geckos in the tributaries of Lauder Creek contributes to a species-rich lizard community and is of potential significance for research into barriers to interbreeding between the two *H. maculatus* species.

2.6.3 Avian Fauna

The dominant habitat on the lease is high tussock grassland. Shrublands are present on lower hill slopes and in river gullies. The lease also includes flatter lowland areas. The presence and distribution of avian species on the lease is a reflection of these land and vegetation patterns. The avian fauna observed during the tenure review inspection is described in Table 6 below. Summary characteristics of each species present are taken from Heather and Robertson (1996).

Table 6 Avian Fauna Observed on Lauder Pastoral Lease

Bird	Scientific Name	Location	Comment
Fantail	*Rhipidura fuliginosa*	Woolshed Creek.	Protected native. Common in all forest types. Diet mainly invertebrates, supplemented by fruit.
Banded dotterel	*Charadrius bicinctus*	A pair with chicks were noted on the main ridge of the Lauder Creek basin.	Protected endemic. Widespread and moderately common. Diet includes terrestrial and aquatic invertebrates supplemented by berries of prostrate plants. Breed only in New Zealand. In Otago breed on braided river beds.

Significance of Avian Fauna

Banded dotterel are a threatened species listed as Gradual Decline. Significant populations of this bird are common in the nearby Mackenzie Basin. Waterways and pasture are likely to provide feeding opportunities.

2.6.4 Aquatic Fauna

Lauder and Woolshed Creeks were fished. These small watercourses of less than 1 cumec run between 1,100 m and 480 m within the Maniototo and Dunstan Ecological Districts. The streams are tributaries of the Manuherikia River catchment which, in turn, forms part of the Clutha/mata-au River Catchment.

Twenty fish species are recorded from the Clutha/mata-au River system. Of these, fifteen are native and five are introduced (Allibone 1997). A search of the NIWA New Zealand Freshwater Fish Database (NZFFDB) was undertaken. No existing freshwater fish records exist for streams within the lease. Eleven records are present for Lauder Creek, however, ten of these are downstream of the lease where brown trout *(Salmo trutta)* and upland bullies (*Gobiomorphus breviceps)* have been recorded. One is upstream of the lease where no fish have been recorded. No records are held for Woolshed Creek on the NZFFDB.

Survey Methods

The streams on the lease were surveyed on 16 and 20 January 2006. Access to the streams was gained by 4WD and by helicopter. Seven sites on two streams were sampled using a Kainga 300 backpack electric fishing machine. The streams were all at normal flows and easily fished. A single pass was made over an area of 40m2 or greater at each site. All fish were identified and returned to the stream. An assessment of water quality and invertebrate populations was made.

Results

Lauder Creek was surveyed at three sites. Lauder Creek is a swift flowing stream which appears to have high water quality and very low levels of pollution. The riparian and catchment vegetation is abundant and predominantly native. Mayflies, in moderate numbers, are the dominant invertebrates at the survey locations. Brown trout (*Salmo trutta)* are present at all three sites and upland bully (*Gobiomorphus breviceps*) are present at one site (Table 7).

Woolshed Creek was surveyed at four sites. Woolshed Creek is a small, swiftly flowing stream above 560 m. its riparian vegetation is dominated by the shrubs matagouri *(Discaria toumatou), Olearia* and *Coprosma* sp. The catchment vegetation is a mix of the same shrubland, native and introduced grasses. Below about 560 m the gradient lessens considerably and the riparian and catchment vegetation is dominated by introduced grasses, shrubs and willow trees. Invertebrate numbers are low at the four survey sites and no fish are present.

Table 7 Lauder Pastoral Lease Sites Fished and Species Recorded

Location	NZMS 260	Species	Threat Status
Woolshed Creek	G41 2247500 558300	Brown trout *Salmo trutta*	Introduced, not threatened.
Woolshed Creek	H41 2251086 5581340	Brown trout Upland Bully *Gobiomorphus breviceps*	Introduced, not threatened. Native, not threatened
Woolshed Creek	G41 2249941 5581891	Brown trout	Introduced, not threatened.

Woolshed Creek	H41 2252789 5579991	No fish	
Lauder Creek	G41 2243917 5586809	No fish	
Lauder Creek	G41 2241800 5586300	No fish	
Lauder Creek	G41 2244200 5588600	No fish	

Significance of Aquatic Values

The upland bully is a common native fish which is not regarded as threatened. It is the probably the most common and widely distributed bully in the South Island (McDowall 1990). Upland bullies occur in widely varying habitats, from swift flowing streams through to lakes, where they form an important part of a functioning in-stream ecosystem. Brown trout is a very common introduced fish.

That part of Lauder Creek within the lease is a natural freshwater ecosystem free of introduced fish. A natural barrier to fish passage and the invasion of trout exists. The location of this barrier is unknown.

That part of Woolshed Creek within the lease is a natural freshwater ecosystem with native and introduced fish present. No apparent natural barriers to fish migration are present.

Both Woolshed and Lauder Creeks are tributaries of the Manuherikia River. The Manuherikia River is identified as a Type I Catchment in the Clutha/mata-au River system (Chadderton *et al.* 2004). Type I catchments are river systems where the majority of the catchment is nationally significant. A key criteria qualifying the Manuherikia River for the Type I listing is the presence of a population of the threatened alpine galaxid (*Galaxias paucispondylus*) in the main stem (Chadderton *et al*. 2004). No alpine galaxid population was found in watercourses on the lease.

2.6.5 Problem Animals

Goats and pigs are present in the Lauder Basin. Rabbits, hares, possums, feral cats, ferrets, stoats, hedgehogs and rats are probably present throughout the lease. These undoubtedly reduce populations of palatable native plants, native birds, reptiles and invertebrates.

2.7 HISTORIC

The documented history of the lease is one of pastoralism, gold-mining and coal mining. This section contains information regarding the historical and archaeological data currently available for the lease and presents new data gathered during the archaeological field survey. The current survey was required to update field data from the 1990 PNAP survey and to record historic resources present on the remainder of the lease that had not previously been visited.

Historic Records

Available historic records describe the history of people who occupied or traveled through the land which encompasses the lease. These records are primarily concerned with the ownership history of the run, gold mining and coal mining.

The original Lauder run, purchased by William Davy and Edmund Bowler on 5 September 1858, was much larger than today. Davy and Bowler also purchased run 244 at the same time, the two properties known collectively as Omakau Station. The Lauder run was the smaller of the two covering an area of 44,800 acres (18,130 ha) while and run 244 covered an area of 46,080 acres (18,648 ha). Omakau Station passed on to Dr Thomas Black of Melbourne on 1 March 1859 (Pinney 1981:100). In 1866 Omakau Station was split back into the original Lauder run and run 244. Lauder was purchased by Des Voux and Cogle and run 244 by Campbell and Low of Galloway Station. Lauder was sold on quickly in March of 1867 to the Glassford brothers, and then in 1869 to a Robert's syndicate and the Handyside brothers (Pinney 1981:101). John Roberts managed the run from Dunedin. Pinney (1981:101) notes that up until 1871, the Lauder run used the Matakanui woolshed but after this date the run built its own twelve-stand woolshed. A survey map (SO 3363) from 1873 of a section of the run confirms that a woolshed and hut (possibly the smithy/cook shop) were built on Lauder by this time (Appendix 5 Figure 2). Both still stand. This map does not show the stables or homestead which indicates these structures may have been built after this time.

The lease for Lauder ceased in 1882. At this time it was divided into five new runs for auction. Handyside and Roberts retained run 226b which contained the free-hold land and farm buildings. The remaining runs were bought by Thomas Keenan and Frederick Morgan (Appendix 5 Figure 3) (Pinney 1981:103). In 1883, Ross & Glendining's holdings bought Lauder from Handyside and Roberts. Lauder then passed onto James Mee in 1907 when the Ross & Glendining's company was sold up. From Mee, Lauder was sold to Dr Arthur Stanley Moody in 1924, who sold the run to a syndicate in 1954 with the lease being managed by Scobie Harley. Harley bought the lease from the syndicate in 1960.

Gold mining on the lease occurred on the lower southeast boundary of the lease, on either side of the road leading to the woolshed between the old Cambrian Settlement Road and the Loop Road. The gold wardens reports from the 1860s to 1907 regarding gold mining between St Bathans and the Lauder lease following the Loop Road, only mentions gold mining on Lauder three times. An 1873 report notes that the gold mining was unfavourable at the "Woolshed" workings due to a lack of water (AHJR 1873, H-7:32). Even though Lauder is not mentioned directly, the previous discussion on mining following the route around from St. Bathans to Cambrians and the early names of Woolshed Creek and Woolshed Hill imply this is the area of mining discussed, not that on the eastern side of Blackstone Hill on the opposite side of the Manuherikia Valley. Also, considering the early mining at Cambrians nearby, this would seem quite probable. A lack of detailed reporting in the AHJR may be due to the focus in the warden's reports on the very prosperous gold mining at Cambrians and Welshman's Gully. Mining on Lauder is next mentioned in 1904 and 1905 as being undertaken using sluicing by R. Jones and Morgan. After this time there is no more mention of mining on the lease. One other source of evidence for early mining on Lauder is a survey map (SO 212) from 1892 which shows a "Tail Race & Education Reserve" at the same location where the remains of sluicings can be seen today (Appendix 5 Figure 4).

Nineteenth century coal mining on Lauder is confirmed by an 1890 survey map (SO 4888) showing the "W. McArthur's Coal Lease Application" for coal mining on the lease at the

location of the pit seen today (Appendix 5 Figure 5). Coal was an essential fuel locally for the mining communities with the other local coal source being nearby at the Cambrians diggings. This coal mine could possibly date as early as the 1870s considering that coal/lignite deposits were often also sought by miners while prospecting for gold. Hamel (1990:4) notes that during her survey the lessee recounted that the coal pit was used by his father.

Previous Archaeological Surveys

The lease was previously surveyed in July 1990 as part of the PNAP. The fieldwork was undertaken by archaeologists Rick McGovern-Wilson and Jill Hamel and reported by Hamel (1990). The January 2006 tenure review fieldwork on the lease re-visited the sites surveyed in 1990. The updated field observations are described below. Hamel (1990) recorded no Maori heritage sites on the lease during that survey.

In addition to the survey by Hamel (1990), a detailed survey of the farm buildings was undertaken by Cochran (1993) as part of the process to register these buildings with the Historic Places Trust. The registration of these buildings has not been completed.

Survey Methods

Streams, creeks or gullies on the lease believed to be locations likely to contain archaeological evidence of past gold mining or pastoral activity were identified, based on historic records. Those which could be surveyed within the timeframe allocated for the tenure review field survey were selected. The lease farm buildings and homestead, gold workings and related water races, and the lease boundaries were surveyed between 16 and 17 January 2006. Limited time was available to record sites in detail.

Newly Recorded and Revisited Archaeological Sites

Six previously recorded sites and one new archaeological site of European/Chinese origin were visited during the field survey. Previously recorded sites included the farm buildings and homestead (New Zealand Archeological Association Site Reference H41/125), coal pit and associated house ruins and machinery (H41/131), three water races (H41/126-128), and 19th century gold mining area (H41/129). The remains of a sod walled hut (H41/130) were identified as a new site.

Farm buildings and homestead (H41/125)

The available architectural information on the farm buildings is extensive due to Hamel's (1990) and Cochran's (1993) report on this farming complex. A description and maps of the farm buildings are at Appendix 5. The establishment of these farm buildings, which are still in use, probably began in 1872.

Water races (H41/126-128)

Three water races stand out on the lease. The first is that running around the top of the coal pit and along the eastern slopes of the Dunstan Mountains moving north in the direction of Donald Stuarts Creek (H41/126). This race ranges in size along the length walked from

Hamel's (1990:5) *c.* 3m wide and 80cm deep to *c.* 2m wide and 30cm deep. This race was not followed to its origins or termination. H41/126 would have been used for both gold mining and for removing over burden in the coal pit where head races can be seen leading down to the pit itself. A lower race (H41/127) also recorded by Hamel (1990:5) could be seen leading out of the Woolshed Creek towards the dam. This dry race can then be seen leaving the dam and following south east along the Lauder Station Road to the sluicings. This race was not walked but at the sluicings end had some water in it. Race H41/128 followed along the top of the gold workings on the north side of Lauder Station Road. This race was the main source of water to the sluicings and originated from outside of the lease boundary, possibly taking water from the reservoirs on the neighbouring lease marked by Hamel (1990: Figure 10) if they still survive. All three races would have been or may still be used for irrigation.

Gold mining (H41/129-130)

The remains of the sluicing on the lease are overgrown by pasture in many places and somewhat eroded. The remains, however, are obvious where tailings, sluice faces, and water, head and tail races can be clearly seen. The area of sluicing is well defined with the grazing of sheep aiding in the site not being overgrown by bush. An interesting feature found during this revisit to the site since Hamel's (1990) survey was the remains of a sod or turf walled hut (site H41/130). These remains are hard to age and may date as early as the 1870s or as late as 1904 if R. Jones and Morgan were using this accommodation structure while living on site. The hut measured 3m in width and 8m long and was divided into two rooms measuring 4.5m and 3.5m wide respectively.

Coal pit (H41/131)

The large pond used by duck shooters defines the location of the coal pit on the lease today. Head races leading to the pit from race H41/126 above with tail races leading away, the high pit walls, winch and pumping machinery remains, a possible dray track, ruined corrugated iron hut possibly used to shelter machinery and an old house platform clearly define this site. As noted above, this pit appears to have been used in the late 19th century and into the 20th century.

Significance of Historic Resources

The above review of the history of the lease and archaeological sites recorded before and during the tenure review field survey, clearly illustrate the rich history of this lease. Three significant 19th century historic events are represented physically on the lease: early pastoralism, coal mining and 19th and 20th century gold mining.

The coal pit, water races and gold mining together demonstrate the varying activities which took place on the lease during the 19th century. The gold mining and related water races represent the western extent of the rich gold field deposits which ran from St Bathans, to Vinegar Hill, Cambrians and then to Lauder. The apparent brief mining at the Lauder sluicings possibly signifies the outer limits of the easily mined payable alluvial gold of this field. The coal pit, shows that gold was not the only precious local resource sought by the 19th century settlers.

The physical evidence of the pastoral history of the lease in particular is of key significance to the history of pastoralism in Otago and New Zealand. The farm buildings are a very early example of 19th century pastoral structures in Otago. These are also an integral part of a working farm. Rather than the buildings having become dilapidated and replaced by modern farm buildings as has happened to many of these structures in Otago, these structures have been well maintained and preserved. The current completion of the registration of these buildings by the Historic Places Trust also illustrates their importance in enlightening the history of the founding or settler years of Otago.

2.8 PUBLIC RECREATION

Physical Characteristics

The lease incorporates varied terrain. The lease extends over almost 7km from south to north and gains approximately 920m in altitude. Moderate to steep hillside rises from the relatively flat low lying front section of the lease. The flat tops characteristic of the Central Otago block mountains, drop steeply into the Lauder basin area before climbing back to the ridge at the back end of the lease. The lease contains a significant portion of the headwaters of Lauder Creek.

Access to the rear of the lease is currently limited. An existing farm track which crosses between Lauder and the Cambrian Hills lease in several places, provides the only access to the back areas of the lease. A second formed track runs across the ridge at the rear of the lease. This ridge forms the Lauder/Cluden lease boundary. This track extends beyond the lease and gives access to other areas of the Dunstan Mountains.

Legal Access

The St Bathans Loop Road adjoins the eastern edge of the lease. The formed 2WD Lauder Station Road runs west off the St Bathans Loop Road and links with the Cambrian Settlement Road which is formed only as far as the homestead. The existing legal access passes through stock yards and near a number of farm buildings currently used for farm operations.

An unformed legal road, Woolshed Creek Road, runs up the west boundary of the lease as far as the hill faces, before turning southwest along the base of the range. This connects with the southwest end of Cambrian Settlement Road, and forms the lease boundary between GR NZMS260 H41 51131E 80465N in the southeast and GR NZMS260 G41 49465E 80635N in the west.

The northeast boundary in Lauder Creek and the northwest boundary of Donald Stuarts Creek face both adjoin the Lauder Basin Conservation Area. An easement through the lease to provide access for management purposes was surveyed when the Lauder Basin Conservation Area was established. This easement has not been registered.

Activities

The lease currently provides opportunities for a range of activities including walking, horse trekking mountain biking, nature and landscape appreciation activities. The area is

occasionally visited by cross country skiers. Hunting opportunities exist with goats, pigs and deer ranging in the area.

Mountain bikes, horses and vehicles are amongst the best ways to gain access to the rear of the lease given the distance and vertical climb. These also provide opportunities to complete longer day trips. The lack of formalised access is likely to be limiting current use of the lease for these activities.

Potential walking routes are available on the lease. These include, for example, a route to Lauder Basin as far the Woolshed Creek/Lauder Creek saddle and returning along the western boundary fenceline. Additional access opportunities would be required to facilitate such a round trip route.

Significance of Recreation

The recreation opportunity setting in the area of the lease is described in the Otago Conservancy Recreation Opportunity Spectrum ROS (Harper, 1992). Compiled for the entire Conservancy, all areas regardless of land tenure were classified and mapped according to setting, activity and recreational experience characteristics. The lease lies within the Back Country Drive In/4WD Drive-In recreation opportunity settings.

The lowland area of the lease is zoned 'Rural'. In this zone the recreational opportunity is characterised by a feeling of being away from urban areas, but in a strongly human modified setting. Common recreational activities include driving for pleasure, horse riding, walking and having picnics.

The Back Country/4WD Drive-In categories are characterised by good road access routes which allow visitors into pockets or corridors which afford a relative sense of remoteness (Harper, 1992). Recreation experiences of this type are described as being 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, exercise, and/or a sense of being close to nature. Activities most often associated with this opportunity are tramping, hunting, fishing, tent camping, climbing, mountain biking, outdoor education and nature appreciation. Day and overnight trips are common.

The Federated Mountain Clubs Conservation Plan (Mason 1988) recognises the area in the Lauder Basin Conservation Area as the only '*natural experience*' zone on the Dunstan Mountains. Much of the Lauder Creek catchment within the lease has similar recreation potential as the Lauder Basin Conservation Area.

The Otago Conservancy CMS recognises the Lauder Basin as a focal point for recreation in the north Dunstan Mountains. It is described as providing for remote experiences in a largely unmodified environment. The sense of remoteness is due, in part, to the extensive tussocklands, pristine alpine water ways and large landscape in which it sits and also for the effort required to access the back area of the lease. The CMS identifies the need to provide for extended walking, mountain biking, horse riding and possibly 4WD opportunities in the north Dunstan Mountains. The lease provides for these extended activities both on its own and in conjunction with adjacent conservation area.

PART 3 OTHER RELEVANT MATTERS AND PLANS

3.1 CONSULTATION

3.1 Consultation

An early warning meeting was held in Alexandra on 23 August 2005. The lease was again discussed on 12 April 2006. Interest groups represented included:

- Forest and Bird
- Upper Clutha Forest and Bird
- Central Otago 4WD
- Queenstown Mountain Bikers
- Public Access NZ
- Conservation Board
- Central Otago Deerstalkers Association
- Otago University Botany Department

The following comments were made with regard to the lease:

- Access to the Lauder Creek Conservation Area is essential.
- All year access for foot/horse/mountain bike and vehicles with permission from lease holder based on condition of track should be provided for.
- Car parking at base of hill away from Homestead and below airstrip should be provided.
- Return Donald Stuart catchment faces to full Crown ownership.
- Return main upper basin of Lauder to full Crown ownership.
- Fencing issue needs to be resolved for adjoining conservation area to prevent illegal grazing.
- Good condition slim snow tussock is present on Dunstan Mountains.
- 4WD access to feral deer in the area is required.
- Access issues may result from deer fencing if leaseholder were to run deer.
- Kanuka/manuka is present on lower slopes.

Written submissions were also received. A summary of these and the key points contained in those submissions are outlined below.

<u>Forest and Bird</u>

- The Lauder review must fully consider the complementary objectives to the Crown Pastoral Land Act 1998 which require … *that conservation outcomes for the high country are consistent with the New Zealand Biodiversity strategy…* and …*To progressively establish a network of parks and reserves….*

- Land on this lease could contribute to a 10,000 ha conservation park in conjunction with other lands nearby.

- Indigenous vegetation is no longer common on the downlands and river flats. Any remnants, particularly where these can act as seed source should be considered for protection. These add to the landscape character of the area and provide valuable habitat for birds, lizards and insects.

- The natural character of the Dunstan Range should be retained. This is an impressive backdrop to the landscape experience of SH85 in its contrast to the plains and downlands below. Remnant tussock and shrublands on the 'front hill country' contributes to the landscape character of the range as a whole.

- Typical plant communities at different altitudes should be retained in order to protect overall landscape integrity. These include large patches of Kanuka which are typical of the indigenous character. The retention of indigenous woody riparian vegetation is important for maintaining healthy riparian systems.

- Effort should be made through tenure review to provide conditions for expansion of indigenous woody vegetation communities and ultimately the return of forest species.

- The existing 4WD track up the true left of Woolshed Creek valley is an excellent access to Dunstan Range summit and Lauder Conservation Area. The Woolshed Creek Road comes close to the start of the track up the hill and using this connection would avoid having the public close to the homestead and historic farm buildings.

- The Lauder Creek catchment would be a valuable extension to the Lauder Conservation Area and associated visual, tramping, botanising and landscape appreciation values and other recreational opportunities. The basin at the Head of Donald Stuarts Creek retains an open and natural tussock landscape. These two blocks have considerable value in that they adjoin the Lauder Basin Conservation Area.

- Secure and proper access to the Lauder Conservation Area will increase popularity of the area with walkers, cross country skiers and others interested in the outdoors. Part of the access would be up the eastern boundary of this lease and in conjunction with parts of the track on the Cambrian lease.

- Securing appropriate public access and recreational opportunities are identified as objectives and priorities for the North Dunstan mountains in the CMS.

Forest and Bird Recommend

- All land in the Lauder and Donald Stuarts Creek basins at the top of the lease and the upper part of Woolshed Creek be returned to the Crown and amalgamated with the existing Lauder Conservation Area
- The larger more diverse patches of indigenous shrubland in Woolshed Creek be fenced and allowed to regenerate as a lowland woody community and wetland with Public access to be provided via Cambrian Settlement Road.

- Public Access to be provided from valley floor to the range top from the end of Woolshed Creek legal road and following existing 4WD track which is partly on Cambrian lease. An additional walking easement along the west boundary fence and down the 4WD track on this ridge would provide for a loop walk which takes in the saddle with its rock tors and pavements.
- The stone buildings need to be protected and restored to a historic complex, preferably with public access.

Federated Mountain Clubs

- Public access to Lauder Basin Conservation Area, to the upper Lauder Basin and Dunstan Mountains is a key issue. Public access on foot, non motorised vehicle e.g. MTB and possibly by horse would promote enhanced recreational enjoyment of Lauder Station and the Dunstan Mountains in general.

- The valley sides of both branches of Woolshed Creek carry native shrublands which have significant natural values

- The natural values and particularly the landscapes of the high country above 1,000m on Lauder Station are of significant importance and should be considered as an alternative to unsustainable pastoral use.

- Much of the land along the high ridge crests is a starkly beautiful landscape of schist tors and windswept coarse gravel pavement.

- Because of the terrain and distances involved, mountain biking or horse trekking would be the best ways to appreciate the expansive features and sheer ‘bignesss’ of landscapes in the Lauder Basin and on the range tops. It also means that longer trips can be completed in one day without the need for camping in places where it is not easy to find water. Mountain biking and possible horse trekking, are therefore probably the best ways to enjoy recreation on the Dunstan Mountains. Public access to the Lauder Basin and the Dunstan tops is a major issue in the tenure review.

- There is a good day walk possibility on Lauder Station which includes the commonly used route up to the Lauder Basin reserve as far as the hairpin bend at about G41 454853, across the Woolshed-Lauder Saddle towards point 1,463 m and a return journey following the fenceline on the western boundary. An easement for public foot access would be required.

- Public access through Lauder Station to the headwaters of Lauder Creek, the Lauder Basin Conservation Area and the wide open expanses of the Dunstan Mountains is a key issue. Public access on foot, non-motorised vehicle (particularly mountain bike) and possibly by horse, would promote enhanced recreational enjoyment of Lauder Station and the Dunstan Mountains in general.

- PNA surveys recognised the significance of natural values and identify Recommended Areas for Protection (RAPS). Lindis RAP A1 North Dunstan partially surrounds the headwaters of both Lauder Creek and Donald Stuarts Creek, but does not actually include much of the land on Lauder Station. However, the landscapes

and natural values of both these high basins are entirely complementary to the Lauder Basin Conservation Area which has now been established over most of RAP A1. The sheer grandeur and 'bigness' of the landscape in the upper Lauder Creek Catchment in particular covering some 2,000 ha strongly suggests that it should be added to the Lauder Basin Conservation Area.

- The entire upper catchments of Lauder Creek and Donald Stuarts Creek should be returned to full Crown ownership and control to be managed for conservation and recreation purposes. These areas should be added to the Lauder Basin Conservation Area. This would overcome an existing problem, which is the lack of adequate fencing along the southeast boundary of the Lauder Basin Conservation Area.

- Because of their outstanding landscape natural values, both the upper Lauder Creek and upper Donald Stuarts Creek catchments should be seriously considered for addition to the Lauder Basin Conservation Area. A further important consideration is whether free holding these areas would 'promote the management of the land in a way that is ecological sustainable' as required by the Crown Pastoral Land Act 1998.

- There are important historic values in the vicinity of the Lauder Station homestead. The original Lauder Station was established in 1856. Many of the buildings still being used today were built about that time. These include the woolshed (with most of its internal structures still intact), the stable, cookhouse and smithy. These buildings are still largely intact. Their historic value is such that they should be protected and preserved. Historic Reserve status would be appropriate. A restoration programme and recognition as an historic 'Farm Park' might be considered.

- Land adjacent to Woolshed Creek was worked for gold in the 1870s. The sluicings near the farm buildings were fed by a water race from a small dam below Woolshed Hill and these features, although partly smothered by woody weeds in places, can still be seen today. With the right commitment to reveal and display the historic significance of the various components of the gold workings the entire area could be included within the Historic Reserve and be developed to complement the historic theme of the 'farm park'.

- FMC notes that in the preliminary proposal for the tenure review of Cambrian that two sections of track on the spur between Donald Stuarts Creek and Woolshed Creek are proposed for public access. The intervening section is on Lauder Station land. We assume that the intention is that public access over the intervening section should be provided for as an outcome of the tenure review of Lauder Station. If our assumption is correct, FMC welcomes this approach of considering together the outcomes on neighbouring properties.

- We note that the preliminary proposal for Cambrian states "it is however essential that the components of access contained within this lease are achieved as an outcome of this review". FMC agrees with the statements about access to the Lauder Basin Conservation Area and to the wider Dunstan Mountains, and commends this approach.

- In order to provide for the public access intended in the Preliminary Proposal for Cambrian (for access from the Loop Road to the existing Lauder Basin Conservation Area) it will be necessary to establish public access on Lauder Station. Public access up Lauder Station Road and along the airstrip to the ford over Woolshed Creek with space for parking at that point, is recommended to get vehicles away from the public highway for security reasons. Continuing public access for foot and non-motorised vehicle across the ford to the point at NZMS 260 G41 499819 referred to in the Cambrian Preliminary Proposal and over the intervening section is also required.

- To create an option for a day trip to the saddle between the Woolshed and Lauder Creek catchments, with return via a different route, provision for public access down the fenceline on the spur between Woolshed Creek and Becks Creek should be considered. An easement for public foot and non-motorised vehicle access may be required.

- The Lauder Station could be purchased in whole and operated as a historic farm park or similar.

- The tenure review of Lauder Station presents a good opportunity to make progress with the achievement of the objectives stated in the CMS for Otago, and presents a challenge to DOC to ensure that these opportunities are not missed.

<u>Southern Lakes Branch of The New Zealand Deerstalkers Association</u>

- Support the acquisition of land by the Crown.
- Expressed concerned that provisions for public access to new conservation areas and revised access to existing areas will limit hunters' ability to access these areas.
- Believe hunters have a significant role to play in the cost effective control of deer and goats. Future management and wild animal control issues may result from limiting access to public land for hunting purposes, as deer and goat numbers increase and they range further onto public land.
- 4WD access for hunters increases access to these animals and increases hunters success and enjoyment.
- Access by permission of landowners is increasingly hard to get.
- Would like to see public access maintained, upgraded or installed to new estate land in the form of easements in favour of all new Zealanders.

3.2 REGIONAL POLICY STATEMENTS & PLANS

Otago Regional Policy Statement

The Regional Policy Statement for Otago provides a policy framework for all of Otago's significant regional resource management issues. It does not contain rules. District Plans shall not be inconsistent with the Regional Policy Statement. In respect of natural values the Regional Policy Statement includes the following policy and method:

Policy: To maintain and where practicable enhance the diversity of Otago's significant vegetation and significant habitats of indigenous fauna, trout and salmon.

> *Method: Identify and protect Otago's significant indigenous vegetation and significant indigenous habitat of indigenous fauna, trout and salmon, in consultation with relevant agencies and with Otago's communities.*

In respect of landscapes and natural features it includes the following policy and method:
Policy: To recognise and provide for the protection of Otago's outstanding natural features and landscapes.

> *Method: Prepare in conjunction with relevant agencies and in consultation with the community and affected landowners, an inventory of outstanding features and landscapes that are regionally significant.*

3.3 DISTRICT PLANS

The lease is located within the Rural Resource Area of the Central Otago District Plan. As at 23 February 2005, the proposed Central Otago District Plan (amended to incorporate Council decisions) requires resource consent (with certain exemptions) for the clearance of areas of indigenous vegetation greater than 0.5 ha or in the case of snow tussock grassland 10 ha, or above 1,080 m, or areas containing any threatened plants listed in a schedule. This requirement does not apply to land that has been freeholded under the Crown Pastoral land Act 1998.

Resource consent is required for tree planting using certain tree species with wilding potential, subject to certain criteria. Resource consent is required for excavations or tree planting within specified distances of a water race or irrigation pipeline, and for development work within 10 m of any water body. There are no registered historic sites or areas of significant indigenous vegetation and habitats of significant indigenous fauna and wetlands as set out in the schedules of the plan

The protected landscape provisions of the Plan require resource consent for development of land over 900 m, with an exclusion for land that has been freeholded under the Crown Pastoral Land Act 1998.

There are two historic sites registered in the plan, being Sites 186 (Bakehouse, Lauder Station) and 187 (Woolshed and Stables, Lauder Station) respectively. Resource Consent is required for any activities that may adversely affect these sites.

Woolshed Creek catchment is subject to the Otago Regional Plan: Water rule which requires resource consent for suction dredge mining.

3.4 CONSERVATION MANAGEMENT STRATEGIES & PLANS

The Otago Conservancy of DOC has prepared a Conservation Management Strategy (CMS) which was approved by the New Zealand Conservation Authority in August 1998. The CMS

identifies 41 special places of conservation interest in Otago Conservancy. The lease lies in the North Dunstans Special Place.

Management issues identified for the North Dunstan Special Place and which have some relevance to the lease include:

- As of right public foot access to the Lauder Basin Conservation Area through adjacent properties is not yet available.
- Ecological research and vegetation monitoring is to be encouraged.
- Signposting and interpretation of protected areas is needed.

The CMS objective for the North Dunstan Mountains is

> *To extend protection in the area to cover the remaining higher altitude areas of nature conservation importance, and to secure appropriate public access.*

Achieving legal public access to the Lauder Basin is an implementation priority as is signposting and increasing public awareness once access is achieved. Other priorities include encouraging research and survey work to increase knowledge of the area and increasing use of the area.

The CMS priorities for this special place are

> *The negotiation of protection arrangements for areas of biodiversity importance and recreational opportunities and access.*

3.5 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 which is a blueprint for managing the country's diversity of species and habitats and sets a number of goals to achieve this aim. Of particular relevance to tenure review, is goal three which seeks to:

- *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 ecosystems 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.*

The strategy outlines action plans to achieve this goal covering terrestrial and freshwater habitat and ecosystem protection, sympathetic management, pest management, terrestrial and freshwater habitat restoration, threatened terrestrial and freshwater species management and so on.

PART 4 ADDITIONAL INFORMATION

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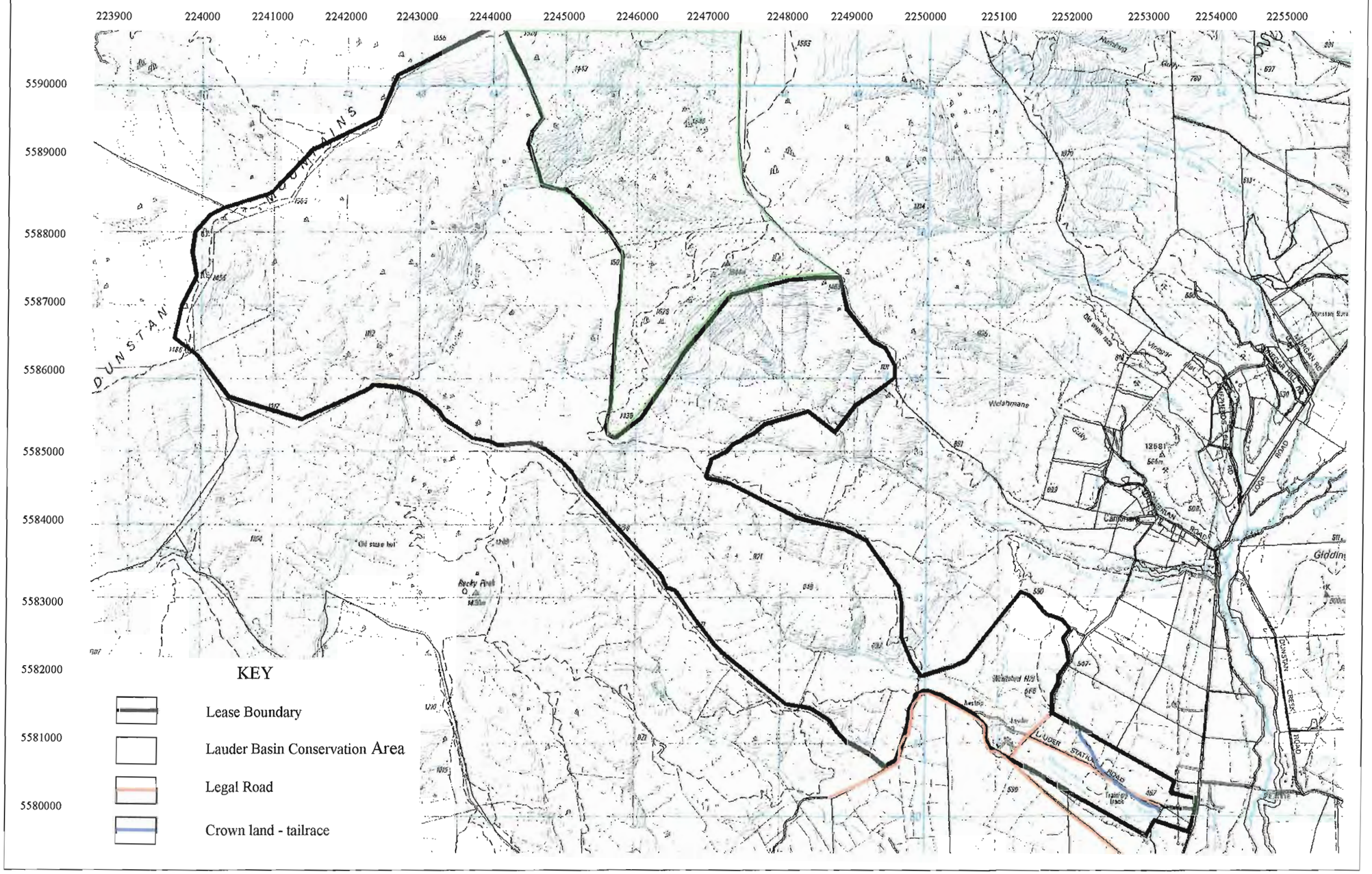
4.2 Illustrative Maps

4.2.1 Lauder Pastoral Lease Topo/Cadastral Map
4.2.2 Lauder Pastoral Lease Landscape Units and Landscape Values
4.2.3 Lauder Pastoral Lease Invertebrate and Herpetofaunal Values
4.2.4 Lauder Pastoral Lease Invertebrate Sampling Areas and Sampling Sites
4.2.5a Lauder Pastoral Lease Vegetation Units
4.2.5b Lauder pastoral Lease Botanical Values
4.2.6a Lauder Pastoral Lease Historic sites
4.2.6b Lauder Pastoral Lease Areas of Historic Significance
4.2.7 Lauder Pastoral Lease Land Environments of New Zealand Analysis



MAP 4.2.1 Lauder Pastoral Lease Topo/Cadastral

NZMS 260 G40, G41, H40, H41

0.7 0 0.7 1.4 2.1 Kilometers

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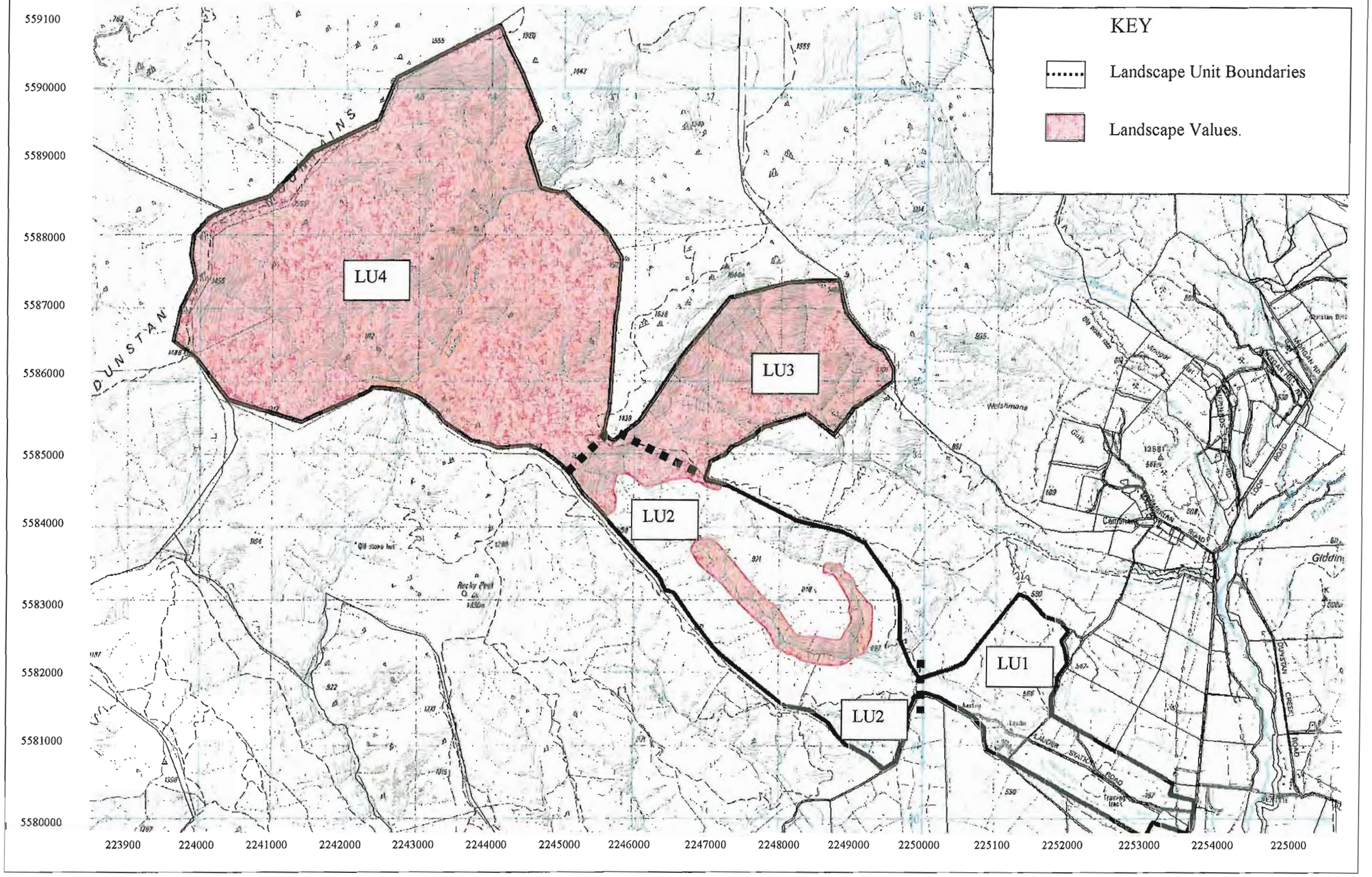
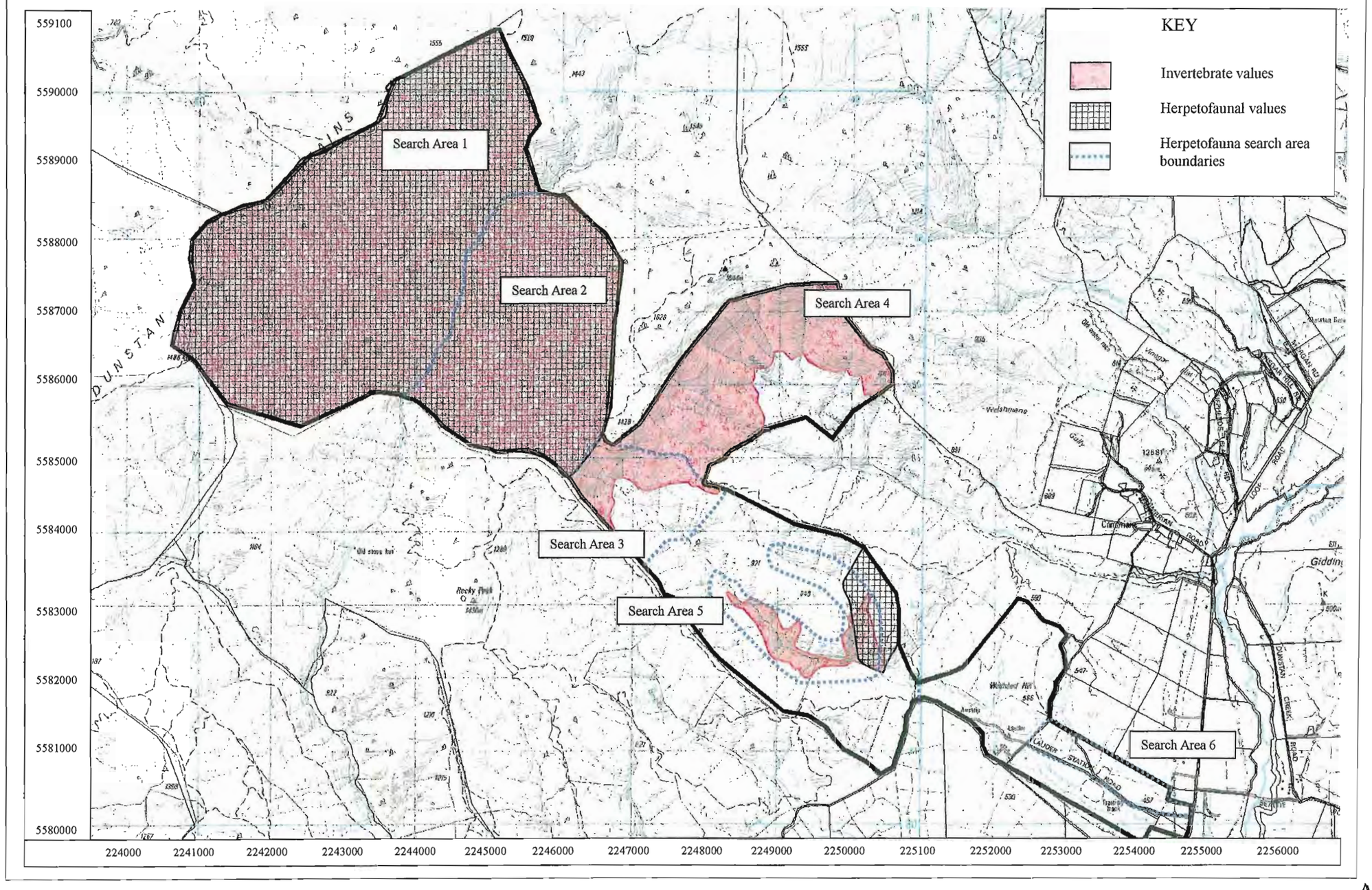
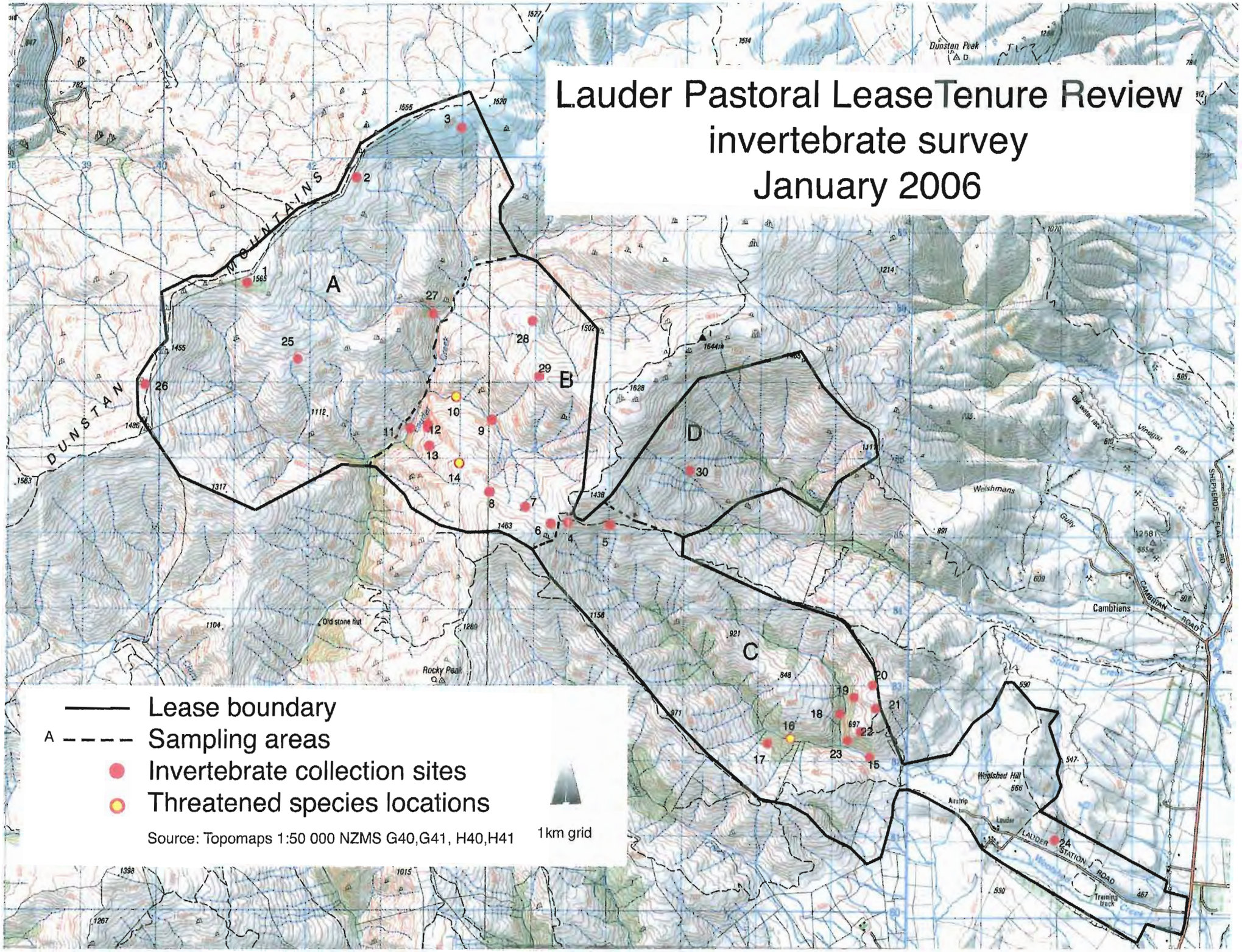


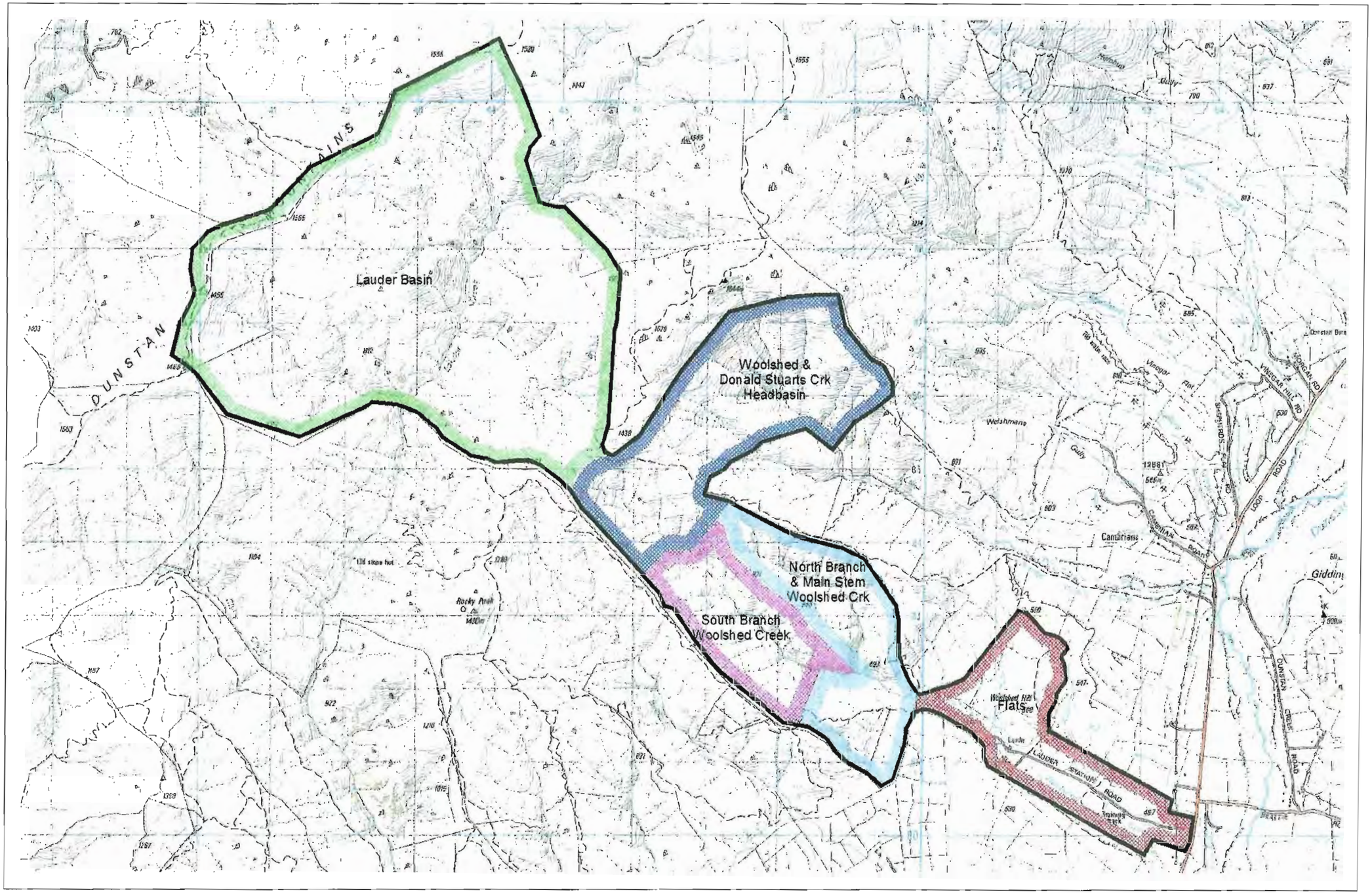
MAP 4.2.2 Lauder Pastoral Lease Landscape Units and Landscape Values



MAP 4.2.3 Lauder Pastoral Lease Invertebrate and Herpetofaunal Values



MAP 4.2.4 Lauder Pastoral Lease Invertebrate Sampling Areas and Sample Sites



MAP 4.2.5a Lauder Pastoral Lease Vegetation Units