Toitu te whenua
Land Information
New Zealand

Crown Pastoral Land
Tenure Review

Lease name: BEN NEVIS & CRAIGROY

Lease number : PO 241 & PO 233

Addendum to
Conservation Resources Report

March 06

ADDENDUM TO BEN NEVIS (P241) AND CRAIGROY (P233) PASTORAL LEASES CONSERVATION RESOURCES REPORTS

INTRODUCTION

An inspection was undertaken on 19th and 20th October 2005 to understand more precisely the character and extent of significant inherent values (SIVs) on ten areas on the lower part of the Ben Nevis pastoral lease, one area on Craigroy pastoral lease and the distribution of any aquatic values across both leases.

This inspection focused on botanical, aquatic, recreational and historic SIVs and was conducted by a multi-disciplinary team of seven people.

1. SURVEY METHOD

Teams were flown by helicopter into the less accessible areas on 19th October whilst the more accessible areas were inspected via vehicle and foot on 20th October. An assessment of the historic SIVs within the lower area of the Schoolhouse Creek catchment was made by foot on 19th October.

The aquatic values were also surveyed over the 19th and 20th October with the majority of the locations inspected falling outside the eleven core areas that were inspected. The extent of these eleven areas and the location of the fishing sites are shown on Plan 1. A description of both the recorded aquatic values throughout the lower portions of both leases and the recorded SIVs in each of these areas follows. Due to lambing two areas on Craigroy pastoral lease could not be inspected.

2. DESCRIPTION OF EACH AREA'S SIVs

The following descriptions of SIVs, except where indicated, are limited to:

a) Those recorded during this inspection;
b) The significant LENZ IV Land Environments; and
c) The relevant SIVs that have recently been given prominence in the recent SIV Guidelines (Connell, 2005).

It is also important to note that the entirety of both leases has significant landscape values and these values are assumed throughout the descriptions. For a comprehensive description of both leases SIVs this report should be read in conjunction with respective leases CRRs. Throughout the following descriptions topographic features as shown on NZMS 260 F42 have been used to identify locations of specific features.

2.1 Aquatic Values

The fish *Galaxias gollumoides*, a non-migratory galaxiid, have previously been recorded in the Nevis catchment. Geological evidence suggests that the Nevis formerly flowed south into the Nokomai branch of the Mataura River system (Waters et al, 2001) and that the catchment was captured by the Clutha River system by flow

reversal during the post-Miocene uplift. Genetic sequence data from the analysis of *G. gollumoides* samples from both the Nevis and the Mataura catchments corroborates this geomorphological hypothesis (Waters, et al 2001).

With the exception of populations present in the Catlins that are more closely aligned with those in Southland river systems, the Nevis populations of *G.gollumoides* are the only populations within the greater Otago region. There are no other non-migratory galaxiid species found within the Nevis catchment, despite another non-migratory species (*G.spD*), being both widespead throughout the rest of the Clutha River catchment and being present in nearby catchments i.e. the Cardrona and Lindis.

The location of the fishing sites and each sites results are shown on table 1.

Table 1

Grid Reference (all NZMS 260 F42)	**Altitude**	**Record**
990 532	998m	*G. gollumoides*
990 502	937m	*G. gollumoides*
001 508	1163m	No fish present
088 509	1190m	No fish present
881 564	918m	No fish present
886 525	1163m	No fish present
876 479	1126m	No fish present
868 445	1218m	No fish present
993 490	924m	*G. gollumoides*
947 526	661m	Brown trout
936 549	820m	*G. gollumoides*
935 564	885m	*G. gollumoides*
944 509	655m	*G. gollumoides*
926 523	724m	Brown trout
944 496	685m	No fish present
934 486	707m	No fish present
915 474	749m	No fish present
905 469	916m	No fish present
903 465	932m	*G. gollumoides*
911 459	831m	Brown trout
911 457	823m	*G. gollumoides*
913 452	787m	*G. gollumoides*
917 447	728m	Brown trout
914 520	825m	*G. gollumoides*
952 542	720m	*G. gollumoides*

The significance of the *G. gollumoides* records for both Craigroy and Ben Nevis pastoral leases is discussed in section 4.4.

2.2 Area 1- (387 ha)

This area corresponds with the farm block known as "Sunny Doolans", which encompasses the face between the riparian area on the true right of the Left Branch

Doolans (altitude approximately 700m) and the ridge defined by Trig U and spot heights 1322m and 1267m.

2.2.1 Botanical values

Below approximately 1000 m there are extensive mixed shrublands dominated by *Olearia odorata, Coprosma propinqua* and matagouri. Other important shrubs include *Corokia cotoneaster, Carmichaelia petriei, Olearia bullata* and *Melicytus alpinus*. Within these shrublands there are occasional trees of kowhai (*Sophora microphylla*) which are likely indicators of the previous forest cover. The shrublands on the lower-most river terraces are comprised of almost pure *Olearia odorata.*

The upper parts of the face have a moderate cover of narrow-leaved tussock with a predominantly native groundcover comprising golden speargrass (*Aciphylla aurea), Pimelea oreophila*, dwarf broom (*Carmichaelia vexillata*), hard tussock (*Festuca novae-zelandiae*), *Leucopogon fraseri, Raoulia subsericea, Gaultheria depressa* and *Scleranthus uniflorus*).

Imbedded within the higher portion of this area are tors and rock outcrops which have distinctive vegetation that includes *Coprosma cheesemanii, Melicytus alpinus, Muehlenbeckia axillaris, Celmisia lyallii, Blechnum penna-marina, Myrsine nummularia, Stellaria gracilenta* and *Thelymitra longifolia.*

The many mossy seeps in this upper portion contain *Olearia bullata, Bulbinella angustifolia, Anaphalioides bellidioides*, mosses, liverworts, *Uncinia* spp. and *Hydrocotyle montana.*

Recorded threatened plants are *Carmichaelia vexillata* ("Serious Decline"- found in the upper tussocklands) and *Vittadinia australis* ("Data Deficient"- found in the middle slopes).

This area encompasses a continuous altitudinal sequence of predominantly indigenous vegetation between approximately 700 m and 1300 m, that forms part of a greater ecological and landscape sequence from the valley floor to the summit ridge of the Hector Mountains.

2.2.2 Level IV LENZ Environments Breakdown

Level 4	**% Indigenous cover remaining nationally**	**% Protected nationally**	**Indigenous Cover Change 97-02 nationally**	**Threat Category nationally**	**Approx. hectares in the area**
Q1.1b	77	8	Decrease	Critically underprotected	47
Q1.1a	98	25	No change	No threat category	11
Q1.1c	91	18	No change	Underprotected	122
Q2.2a	40	4	Decrease	Critically underprotected	207

2.2.3 Recreational SIVs

The farm track that runs along the ridge which forms this area's southern boundary is an ideal access route into the Hectors/Remarkables for recreationalists travelling south from Gibbston to the Nevis Valley via Coal Pit Saddle.

2.3 Area 2 (327 ha)

This area encompasses the land between the existing marginal strip on the true left of the Nevis River and the ridge crest defined north to south by Doolans Saddle and spot heights 923m and 900m. The area is characterised by steep, unstable slopes with numerous large bluffs, rock outcrops and gorges.

2.3.1 Botanical SIVs

There are extensive mixed shrublands running the entire length of this area that are dominated by *Olearia odorata*, matagouri, *Aristotelia fruticosa* and sweet briar. A matrix of rocky environments is present comprising outcrops, bluffs, overhangs and colluvial boulder fields, and these provide a variety of habitats. Damp and shady rock bluffs and outcrops have a wide range of herbs which are otherwise uncommon or absent from surrounding grasslands and shrublands. Typical species include *Anisotome aromatica, A. cauticola, A. flexuosa, Cystopteris tasmanica, Celmisia* sp., and *Schizeilema haastii.*

Likewise the dry and sunny rock bluffs and outcrops have a wide range of herbs and shrubs which are otherwise uncommon or absent from the surrounding grasslands and shrublands. Typical species include *Helichrysum intermedium, Hebe pimelioides* subsp. *faucicola* and *Pachycladon cheesemanii.*

Recorded threatened plants are *Hebe pimelioides* subsp. *faucicola* and *Pachycladon cheesemanii* (both ranked Gradual Decline).

2.3.2 Level IV LENZ Environments Breakdown

Level 4	**% Indigenous cover remaining nationally**	**% Protected nationally**	**Indigenous Cover Change 97-02 nationally**	**Threat Category nationally**	**Approx. hectares in the area**
N4.1d	19	3	No change	Chronically threatened	55
N3.2a	7	1	No change	Acutely threatened	84
Q2.2a	40	4	Decrease	Critically underprotected	187

2.4 Area 3 (212 ha)

This area encompasses the farm block known as Sunny Ryders and spans the altitudinal sequence between approximately 800m to 1680m.

2.4.1 Botanical SIVs

This area encompasses a continuous altitudinal sequence which stretches from alpine herbfield on the ridge tops (c. 1680m) to valley floor riparian shrublands (c. 1000m). The alpine herbfield includes a large population of *Myosotis pygmaea* var. *drucei* set in scattered *Chionochloa rigida,* the latter of which extends downslope to the Nevis Burn. This tussockland is intact with a good diversity of inter-tussock herbs and is intermixed with both *Aciphylla* "Lomond" and *Hebe anomala.* Shrub density increases towards the Nevis Burn with matagouri, *Coprosma propinqua, Olearia bullata* and *Carmichaelia petriei* being the dominant species. The exotic ground cover increases (with a corresponding decrease in botanic SIVs) in the lower portion of the area near the Nevis Burn and is interspersed with heavily grazed *Chionochloa rigida* and cattle pugged wetlands. These wetlands consist of scattered flushes and impounded drainage bogs with occasional specimens of *Carex kaloides* and *Ranunculus maculatus* (ranked Date Deficient). This area of exotic vegetation interspersed with the aforementioned remnant indigenous vegetation is below the two water races marked on F42 which are centred on grid reference F42 908 531.

The continuous altitudinal sequence of predominantly indigenous vegetation between approximately 1000m and 1680 m forms part of a greater ecological and landscape sequence from the lower slopes to the summit ridge of the Hector Mountains.

2.4.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
Q2.1b	66	4	No change	Critically underprotected	2
Q2.2a	40	4	Decrease	Critically underprotected	53
Q1.1c	91	18	No change	Underprotected	91
Q1.2a	99	37	No change	No threat category	30
Q1.1b	77	8	Decrease	Critically underprotected	37

2.5 Area 4 (170 ha)

This area encompasses the riparian margins of the Nevis Burn between approximately 700m and 800m.

2.5.1 Botanical SIVs

The flood plain is dominated by exotic grasses interspersed with scattered matagouri and the occasional willow. The hill slopes above this plain are thickly clad with a brier/ matagouri/gooseberry dominated shrubland. A c. 2 m diameter patch of *Myosurus minimus* subsp. *novae-zelandiae* (Nationally Endangered) was recorded at the base of the toe slope on the true right of the Nevis Burn, grid reference being GR F42 2193709E 5552218N.

2.5.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
K3.3b	7	5	No change	Acutely threatened	36
N6.2a	18	5	No change	Chronically threatened	22
Q1.1b	77	8	Decrease	Critically underprotected	3
N4.1d	19	3	No change	Chronically threatened	3
Q3.3b	81	1	Decrease	Critically underprotected	1
N3.2a	7	1	No change	Acutely threatened	22
Q2.2a	40	4	Decrease	Critically underprotected	62

2.6 Area 5 (63 ha)

This area encompasses an east facing slope on the true left of Scotsman Creek centred on grid reference F42 910 525.

2.6.1 Botanical SIVs

None were recorded as this area is dominated by exotic grasses and hieracium with occasional hard tussock and *Chionochloa rigida*.

2.6.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
Q1.1b	77	8	Decrease	Critically underprotected	40
Q2.1b	66	4	No change	Critically underprotected	6
Q1.1c	91	18	No change	Underprotected	1
Q2.2a	40	4	Decrease	Critically underprotected	16

2.7 Area 6 (108 ha)

This area encompasses the narrow strip of land stretching between Schoolhouse and Scotsman Creeks that is sandwiched between the top of the 1930s workings and a retirement fence. From a landscape perspective this area is undistinguishable from these two features.

2.7.1 Botanical SIVs

None were recorded as indigenous vegetation is limited to scattered *C. rigida* in the upper part of the area.

2.7.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
Q3.3b	81	1	Decrease	Critically underprotected	2
Q1.1b	77	8	Decrease	Critically underprotected	51
N3.2a	7	1	No change	Acutely threatened	22
Q2.2a	40	4	Decrease	Critically underprotected	26
Q2.1b	66	4	No change	Critically underprotected	7

2.8 Area 7 (433 ha)

This area encompasses two dissimilar areas, being firstly both riparian margins of Schoolhouse Creek and secondly five partially developed blocks to the north of the creek. The SIVs are described below separately for these two areas.

2.8.1 Riparian areas of Schoolhouse Creek

a) Historic values

The archaeological/historic remains in Schoolhouse Creek have previously been described as containing evidence of 19th and early 20th century mining such as sluiced faces, tailings, water races, the remains of sod walled huts, a pack track, mining artefacts and the remains of a telephone pole, as well as the location of a previously recorded moa-hunting site (F42/5) (Hamel 1996: 5, 18, 21-22; Middleton 2005:20-21).

This area also contains an outcrop of porcellanite (a rock worked by Maori for making stone tools) and possibly a small moa butchery site, last sighted in 1917. The quarry would have been the source of porcellanite sought for tool making by Maori who occupied the moa-hunting camp site previously recorded at the mouth of Schoolhouse Creek (NZAA Site Record Number F42/7). Examples of the porcellanite flake tools found at site F42/7 are in the Otago Museum.

Other than the quarry being a source of procellanite for Maori in the valley and uncommon in itself being found so near a moa-hunting occupation, it appears from photographs of this site that evidence of flake tool making may be present at the quarry face. This makes the quarry a potentially rare example of this prehistoric practice in Otago. However, this observation needs to be conclusively determined.

There is a multitude of historic sites associated with differing periods of gold mining in the Nevis Valley. As mentioned several of these have been previously documented in the Ben Nevis CRR. New sites and previous sites recorded in detail during this inspection included:

i) Numerous iron gold mining artefacts including a pick and gold pan;
ii) A lignite quarry and processing area;
iii) A fenced compound and associated building ruins in stacked schist and stacked walling; and
iv) A possible 19th century rubbish pit by the road.

b) Botanical Values

Present on the terraces is a mixture of indigenous and introduced grassland, with scattered matagouri dominated shrublands. The old stable flood debris contains *Raoulia australis, R. glabra, R. hookeri, Muehlenbeckia axillaris, Acaena saccaticupula* and *Aciphylla aurea*. Matagouri, sweet brier and porcupine shrub are also common here.

The old stream channels, cutoff meanders and seepage areas contain wetlands with a range of rushes and sedges which are mainly introduced i.e. *Juncus effusus* and *J. articulatus*. Prominent native species include *Carex gaudichaudiana* and *Isolepis aucklandica*.

Overall the plant community of the flood plain is introduced grassland similar to that on the terraces and is closely grazed. Some of the wetland species such as *Schoenus pauciflorus* and *Juncus articulatus* form occasional patches as do both red and hard tussocks.

Red tussock occurs as scattered individuals and as small patches over parts of the river flats. One extensive area within a very wet, old stream channel was inspected and is in a reasonably natural state. Other tall species include clumps of *Schoenus pauciflorus, Carex coriacea, Juncus effusus* and *J. articulatus*. Patches of sphagnum moss (*Sphagnum cristatum*) and other bryophytes are common, as are several species of small native herbs. Two small patches of *Ranunculus ternatifolius* ranked "Nationally Vulnerable" were also recorded.

2.8.2 Terrace on northern side of Schoolhouse Creek

On the terrace riser immediately above Schoolhouse Creek there are occasional patches of remnant shrubland, composed predominantly of *Coprosma dumosa* and *Melicytus alpinus*. Several patches of the threatened dwarf broom *Carmichaelia vexillata*, ranked "Serious Decline" are present near the eastern and southern edges of the terrace tread where very well drained gravel soils give rise to a suite of drought tolerant herbs, grasses and dwarf shrubs.

The drier areas of the terrace tread, though are dominated by exotic grasslands and hawkweed, have a large component of native species characteristic of dryland short grassland. These include large areas of *Carex muelleri* (ranked Sparse), hard tussock, *Acaena caesiiglauca, Raoulia subsericea, Scleranthus uniflora, Luzala rufa* and *Pimelea oreophila*.

The most extensive indigenous vegetation in this area is a large area (~50 ha) of red tussock wetland. This is the most conspicuous expression of the wetness of the terrace but a catena of wetland communities extends almost to the most eastern extent of the terrace, at which point they are confined to shallow ephemeral channels. This wetland catena includes sedgelands, sphagnum mossland, herbfield and turfs of ephemeral channels.

The red tussockland contains a relatively large population of *Ranunculus ternatifolius* (ranked "Nationally Vulnerable"), and amongst the other wetland communities are strong populations of *Carex kaloides*, *C. uncifolia* (ranked Range Restricted), and *Euchiton ensifer* (ranked Sparse). These strong populations of both *Carex* spps. are some of largest in Otago and possibly nationally. At the drier eastern edge of the terrace the sedge *Carex muelleri* (ranked "Sparse"), and orchid *Hymenochilus tanypodus* (ranked Sparse) are widespread. The shallow ephemeral channels contain large populations of *Carex uncifolia* and *C. kaloides* and a diversity of wetland types

either rare or not present in the area surrounding the red tussock wetland. The entire wetland sequence is very vulnerable to damage from stock.

Both sequences, being the altitudinal sequence contained in the riparian margins of Schoolhouse and the hydrological sequence contained on the terrace to the north of this waterway contain viable populations of indigenous vegetation and form part of a greater ecological and landscape sequence from the valley floor to the summit ridge of the Hector Mountains.

2.8.3 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
K3.2a	25	6	No change	At risk	44
N3.1d	14	1	Decrease	Chronically threatened	89
Q2.2a	40	4	Decrease	Critically underprotected	1
N6.2a	18	6	No change	Chronically threatened	45
N5.1c	3	2	No change	Acutely threatened	1
N5.1a	3	1	No change	Acutely threatened	182
N4.1d	19	3	No change	Chronically threatened	11
N4.1b	17	1	No change	Chronically threatened	27
K3.3b	7	5	No change	Acutely threatened	26

2.9 Area 8 (264 ha)

This area encompasses a farm block known as Sunny Schoolhouse and spans the altitudinal sequence between approximately 700 m to 1480 m.

2.9.1 Botanic SIVs

Exotic grasses and herbs are the dominant ground cover in the lower portion of this area and their cover decreases with altitude until at approximately 1000 m the ground cover is completely dominated by indigenous vegetation.

Remnant shrubland is present in the riparian area along Schoolhouse Creek and on adjoining slopes between approximately 700 m to 1200 m. Characteristic species of these shrublands include matagouri, *Hebe* and *Coprosma* species. Individual species

include *Hebe anomala, H. propinqua, Carmichaelia petriei, Coprosma ciliata, Aristotelia fruticosa, Olearia odorata, Dracophyllum longifolium, Olearia cymbifolia* and mingimingi (*C. propinqua*). These shrublands are the robust survivors of the pre-human woody vegetation in this area and are a significant seed source for future regeneration.

Throughout the area *Chionochloa rigida* persists and its extent increases with altitude. *Chionochloa macra* begins to appear at approximately 1500 m. Of particular note is a record of a type of cress found within a boulderfield. This is an unusual *Cardamine* is known elsewhere only from one site (which is on the Old Man Range) and may represent an unnamed species (Peter Heenan, Landcare Research pers. com).

This area contains a continuous altitudinal sequence of indigenous vegetation between approximately 700 m and 1460 m, that forms part of a greater ecological and landscape sequence from the valley floor to the summit ridge of the Hector Mountains.

2.9.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
N3.1d	14	1	Decrease	Chronically threatened	
Q1.1c	91	18	No change	Underprotected	119
Q1.2a	99	37	No change	No threat category	9
K3.2a	25	6	No change	At risk	4
Q2.2a	40	4	Decrease	Critically underprotected	116
Q1.1b	77	8	Decrease	Critically underprotected	1
N3.2a	7	1	No change	Acutely threatened	2
Q3.3b	81	1	Decrease	Critically underprotected	8

2.10 Area 9 (199 ha)

This area encompasses the portion of terrace above Schoolhouse Flat between Schoolhouse Creek to an unnamed tributary of the Nevis River that is centred on grid reference F42 920 457.

2.10.1 Botanical SIVs

This area is characterised by exotic grasses and hieracium dominating the drier areas, with intact *Chionochloa rigida/C. rubra* tussocklands dominating the majority of the

wetter areas. *Ranunuculus ternatifolius* (Nationally Vulnerable) was recorded in one such area. These areas of *Chionochloa* spps. tussocklands, particularly those at the northern end of this area, contribute to the hydrological functioning of Schoolhouse Flat, as these wetter areas provide a steady supply of moisture to the Flat. These northern areas also contribute to the altitudinal sequence of relatively intact indigenous vegetation that runs from the Flat to the summit ridge of the Hector Mountains.

2.10.2 Aquatic SIVs

Galaxias gollumoides (gradual decline) were recorded at GR F42 903 465.

2.10.3 Level IV LENZ Environments Breakdown

Level 4	**% Indigenous cover remaining nationally**	**% Protected nationally**	**Indigenous Cover Change 97-02 nationally**	**Threat Category nationally**	**Approx. hectares in the area**
N3.2a	7	1	No change	Acutely threatened	39
K3.2a	25	6	No change	At risk	12
N3.1d	14	1	Decrease	Chronically threatened	4
Q2.2a	40	4	Decrease	Critically underprotected	52

2.11 Area 10 (381 ha)

This area encompasses the farm block known as Sunny Commissioners and includes the altitudinal sequence between approximately 700 m to 1260 m. Due to time constraints and the obvious demarcation between modified and unmodified land only the bottom most obviously modified portion of this area was physically inspected. Through observations via binoculars and the naked eye it is evident that the unmodified section contains dense, intact snow tussockland grasslands and remnant riparian and montane shrublands. Given both its aspect and altitudinal range this higher section of Area 10 is highly likely to harbour similar species and communities to those recorded in both Areas 3 and 8.

2.11.1 Botanical SIVs

The streamside gravel flats are vegetated with adventitious native species.

The riparian shrublands are composed of *Melicytus alpinus, Coprosma dumosa, C. propinqua,* matagouri, *Olearia bullata* and rare *Olearia odorata* and *Dracophyllum* sp. with a significant component of gooseberry.

The higher terrace is vegetated with exotic grass interspersed with hard tussock and *Carex muelleri*. Hard tussock and *Chionochloa rigida* communities become more prevalent and intact with altitude.

The track which branches off the Nevis Road at GR F42 999 432 provides a practical route onto a major ridge which leads into the Hector Mountains.

2.11.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
K3.2a	25	6	No change	At risk	19
Q2.2a	40	4	Decrease	Critically underprotected	184
Q3.3b	81	1	Decrease	Critically underprotected	6
Q1.1c	91	18	No change	Underprotected	138
N3.1d	14	1	Decrease	Chronically threatened	1
Q3.3c	90	17	Decrease	Underprotected	6
Q1.1b	77	8	Decrease	Critically underprotected	187

2.12 Area 11 (142 ha)

This roughly rectangular area is at the northeastern extremity of Craigroy pastoral lease and encompasses the land bound by the leases eastern and northern boundaries and to the south the Nevis Road. Its western extent is approximately the confluences of two unnamed tributaries (centred on grid reference F42 006 524) which flow from the north and south of Watts Rock respectively.

2.12.1 Botanical SIVS

The area includes the headwaters of the aforementioned unnamed tributaries of the Nevis River. These headwaters are mostly in the form of flushes and seeps with considerable variation in community composition and generally high species diversity. The wettest areas are dominated by moss and liverwort species but elsewhere common species include *Plantago triandra, Epilobium komarovianum, Celmisia gracilenta, C.* "rhizomatous bog", *Gaultheria parvula, Leptinella squalida, Gonocarpus micranthus* and *Cardamine debilis*. Patches of comb sedge (*Oreobolus pectinatus*) and *Carex kaloides* are also present.

The vegetation is predominantly indigenous, with an abundance of golden speargrass indicating repeated past burning. Tall tussock cover is very patchy with short tussock (alpine fescue tussock) taking its place over extensive areas. A feature of the spur crest near the Nevis Road is mostly bare areas subject to frost heave and wind

ablation for which a small number of hardy diminutive grasses and *Epilobium* sp. have colonised. There are many tors and rock outcrops present which have afforded woody species in particular, a refuge from fire. Such species include *Dracophyllum* spp, *Coprosma cheesemanii* and *Myrsine nummularia*. Associated with some of the larger rock outcrops on slopes are small boulder fields with *Muehlenbeckia complexa, Blechnum penna-marina* and *Gaultheria depressa*.

The area is easily accessible from the Nevis Road and provides attractive walking terrain.

2.12.2 Level IV LENZ Environments Breakdown

Level 4	% Indigenous cover remaining nationally	% Protected nationally	Indigenous Cover Change 97-02 nationally	Threat Category nationally	Approx. hectares in the area
Q1.1a	98	25	No change	No threat category	1
Q1.1b	77	8	Decrease	Critically underprotected	83
Q3.3a	97	26	No change	No threat category	53

3. PROBLEM PLANTS, ANIMALS AND THREATS

Introduced plants that may have an important effect on indigenous plant communities in these areas and that can be controlled or contained, are listed and discussed below. Other ubiquitous naturalised species for which containment or control are probably impractical, such as mouse-ear hawkweed and pasture grasses aren't discussed here. It is noted however that maintaining a tall, vigorous cover of vegetation and deep litter layers is the best means of minimising the spread and reducing the cover of *H. pilosella* (Rose & Frampton 1999).

Wilding conifers

Scattered wilding conifer trees were recorded in Areas 1, 9 and 10; and are highly likely to be present in Areas 2, 3 and 8. Wildings pose a significant and on ongoing threat to areas of low-stature vegetation on both leases, including the important high-altitude plant communities. Removal of wilding trees, and regular checks for new infestations, will be required to protect conservation values on these properties.

Other Woody Weeds

Sweet briar is a conspicuous component of the shrublands in Area 2, and it is probably not feasible to attempt to control it. For the purpose of biodiversity conservation, briar may best be exploited as a nurse community for the long term regeneration of taller indigenous woody species (Walker et al. 2002).

A small area of broom in Area 9 should be eradicated.

Other Weeds
An area of the weedy grass *Nardus stricta* / mat grass was provisionally recorded as scattered clumps with a 100m section of Area 7. This grass has the potential to be a severe environmental weed in the wetland areas. The conclusion identification of this grass has yet to be confirmed.

Problem Animals
Although not recorded in all the areas inspected, it is highly likely that goats, pigs and deer are present throughout both leases. Left unchecked these animals have the potential to cause significant damage to the vegetation and habitat of indigenous fauna.

4. SIGNIFICANCE OF THE AREAS AND THE RECORDED SIVS

4.1 Significance of LENZ Environments

Walker et. al (2005) have identified New Zealand's land environments (LENZ; Leathwick et al. 2003) that are most vulnerable to biodiversity loss. Two criteria are used to identify biodiversity that is most vulnerable (most likely to be lost). These are:
a) poor legal protection (reflected by low percentages legally protected); and
b) past habitat loss (reflected by low percentages of remaining indigenous cover).

Based on these two criteria, they recommend five categories of threatened environments to identify environments containing indigenous biodiversity at most risk of loss, being:

a) Acutely threatened (<10% indigenous cover remaining);
b) Chronically threatened (10-20% indigenous cover remaining);
c) At risk (20-30% indigenous cover remaining);
d) Critically underprotected (>30% indigenous cover remaining and <10 protected); and
e) Underprotected (>30% indigenous cover remaining and 10-20% protected)[1].

The much-reduced and highly modified areas of indigenous cover remaining in these threatened environments support a disproportionately large percentage of New Zealand's most seriously threatened species, habitats, and ecosystems. The protection of what remains in these environments is essential to halt the decline of New Zealand's indigenous biodiversity.

Level IV of LENZ more adequately reflects the distribution of biodiversity, past clearance and current vulnerability across the landscape than higher levels of LENZ (e.g. Level II). Consequently, threat classification at Level IV rather than Level II will result in substantially more effective and efficient identification of threatened remaining indigenous cover.

[1] Firstly note that the first three categories are regardless of the percentage protected and secondly that the "no threat" category has >30% indigenous cover remaining and >20% protected.

Almost two-thirds of New Zealand's Level IV Land Environments are classified within one of five categories of threat based on indigenous cover loss and poor protection. Between 60% and 90% of remaining indigenous cover in these threat categories is not legally protected. High proportions of this remaining indigenous cover are on land of low value for agricultural production.

For the determination of the significance of the Level IV Land Environments Table 2 the five aforementioned categories have been further compressed into three classes, being *much reduced*- less than 20% of their land areas still in indigenous cover, *at risk*- 20-30% of their land areas still in indigenous cover and *underprotected*. The IV Land Environments in the "no risk" category have not been commented on. Please note that due to rounding the sum of IV Land Environments for some of the areas does not add up to 100%.

Table 2

AREA	% OF AREA ACUTELY AND CHRONICALLY THREATENED i.e. *MUCH REDUCED*	% OF AREA AT RISK i.e. *AT RISK*	% OF AREA CRITICALLY UNDERPROTECTED AND UNDERPROTECTED i.e. *UNDERPROTECTED*
1			97
2	43	57	
3			86
4	60		38
5			100
6	20		79
7	88	10	
8	3	2	93
9	22	6	72
10	<1	5	94
11			58

What is notable is the classification of a high percentage of the areas inspected as either *much reduced* or *underprotected* LENZ IV Land Environments and the presence of extensive intact and viable indigenous vegetation in the said areas. For example, 97% of Area 1 is classified as being *underprotected* LENZ IV Land Environments and is predominantly vegetated in indigenous vegetation. Likewise for Area 7, 88% classified as *much reduced* LENZ IV Land Environments and within it, as summarised below, are extensive representatives of significant vegetation types and ecosystems.

4.2 Significance of the vegetation

The diverse mature shrublands in Areas1, 2, 3 and 8 are a rare woody ecosystem in the montane zone and represent good examples due to their size and intactness. The woody species are highly significant relicts or derivatives of the former forest and shrub cover that would have clothed the lower slopes in pre-human times. The importance of woody vegetation in Central Otago has been given prominence by

Walker et al. (2003). The examples remaining on this lease form a core from which recovery to their former extent could occur. The recovery of shrublands in the absence of grazing and fire has been demonstrated at several sites in Central Otago (Walker loc.cit.).

The tussock grassland and associated vegetation in the higher altitude portions of areas 1, 3, 7, 8 and 10 and the wetter parts of area 9 are highly representative derivatives of the pre-human vegetation and their significance is enhanced by the continuity they have with similar adjoining vegetation alongside and above them.

Wetlands are dotted throughout the easier valley and terrace topography but are especially prevalent in Area 7. Several different types are present. These include flushes, bogs, swamps and ephemeral channels. As areas of high species richness, they make a disproportionately high contribution to the biodiversity of the leases. Wetlands nationally have undergone a 90% reduction and remaining examples, particularly those in the lowland and montane zones, are a priority for protection. Several threatened species in Table 3 are restricted to wetland habitats (e.g. *Ranunculus ternatifolius, Carex uncifolia* and *Euchiton ensifer*).

The drier portion of Area 7 is representative of a rare ecosystem in Otago that is increasingly under threat, being an ancient dry Pleistocene outwash terrace underlain by 20 million year old Manuherikea sediments. These older sediments contain both coal and oil shale and both their economic potential and fossil pollen record have previously been assessed (Williams, 1974). These drier portions also contain significant populations of *Carmichaelia vexillata* (ranked Serious Decline) as well as *Carex muelleri* and *Hymenochilus tanypodus* (both ranked Sparse).

4.3 Significance of the Sequences

Areas 1, 3, 7, 8, 9 and 10 contribute to altitudinal sequences of indigenous vegetation. On their own areas 1 and 3 provide a valuable link to higher altitude areas of Ben Nevis pastoral lease that were identified as containing highly significant inherent values.

Areas 7, 8 and 9, in combination with both lower and higher altitude areas previously identified as containing highly significant inherent values, form a highly significant altitudinal sequence which runs from the Nevis River to the summit of the Hector Mountains. Such combinations, being warm, relatively unmodified areas with viable populations of representative indigenous vegetation, functionally linked with the valley floor, with a relatively intact sequence of many juxtaposed native communities, are rare in Otago. This rarity is heightened as the sequence contains viable pre-human vegetation of the area, being dryland, riparian, wetland, shrubland and alpine communities.

4.4 Significance of Aquatic Values

The New Zealand non-migratory galaxiid fishes recovery plan 2003-2013 (DOC 2004) contains action points requiring the identification of 30 key non-migratory galaxiid sites for each species; the prevention of invasion of these sites by fish species

not historically present; and the protection and management of these sites, according to a set of hierarchical criteria. The figure of 30 key populations is arrived at by doubling the 15 population figure, which meets the criteria for Gradual Decline status and thus provides security of protection. Nationally 4 discrete populations of *G.gollumoides* are protected.

Contributing to the significance of the Nevis populations of *G.gollumoides* is that they are of scientific interest in that their capture by a geological event provides a rare opportunity to compare the rate of evolutionary change between discrete populations of a species measured against a known timescale.

The major threats to *G.gollumoides* are:

a) Water or gravel abstraction;
b) Invasion of habitat by trout and/or salmon;
c) Habitat destruction by stock, particularly mob stocking, cattle and deer; and
d) Habitat destruction by other means i.e. riparian vegetation clearance, straightening of waterways etc.

4.5 Threatened Species

Of the native vascular plant species present in the eleven areas, nine species are listed as threatened and a further one 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 eleven areas is provided below in Table 3. One threatened fish species was also recorded. Plan 1 has the location of sites that contain *G. gollumoidies* and which fall outside the eleven core areas.

Of particular importance are the occurrences of NZ mousetail (*Myosurus minimus* subsp. *novae-zelandiae*) and wetland buttercup (*Ranunculus ternatifolius*). Taxa in the Acutely Threatened division of the NZ Threat Classification System face a very high risk of extinction in the wild.

Species listed in the categories Serious Decline and Gradual Decline fall within the grouping 'Chronically Threatened'. Species in this grouping 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.

Table 3

Threat Division	Threat Category	Species	Area
Acutely Threatened	Nationally Endangered	*Myosurus minimus* subsp. *novae-zelandiae*	4
	Nationally Vulnerable	*Ranunculus ternatifolius*	7,9
Chronically Threatened	Serious Decline	*Carmichaelia vexillata*	1,7
	Gradual Decline	*Pachycladon cheesemanii*	2
		Hebe pimelioides subsp. *Faucicola*	2
		Galaxias gollumoides	9
At Risk	Sparse	*Carex muelleri*	7, 10
		Euchiton ensifer	7
		Hymenochilus tanypodus	7
	Range Restricted	*Carex uncifolia*	7
Data Deficient		*Vittadinia australis*	1
		Ranunculus maculatus	4

4.6 Significance of Historic resources

From the recent survey and the data previously provided by Hamel (1996) and Middleton (2005), there is clear and ample evidence that all sites within a 300 m strip on either side of Schoolhouse Creek are significant. These sites in total add extensively to the knowledge of the early history of the Nevis Valley from the period of moa-hunting to early 20th century gold mining and add considerably to our understanding of the heritage landscape in the valley.

The porcellanite quarry identified is particularly significant, as Anderson (1989:160) notes that only 15 porcellanite quarries have been recorded in the Southern South Island with this information provided by landowners and '*limited field sampling*'. Data on which porcellanite quarries in the Southern South Island have worked flakes at the quarries themselves and which were only sourced for good flake tool material is lacking. Hence, at present New Zealand archaeologists cannot quantify the rarity of porcellanite quarries in Otago where flake tool making was occurring. These sites are highly significant, however, as they tell us conclusively that Maori were at that spot in prehistory undertaking a particular task which was directly related to other activity in an area.

The significance of the porcellanite quarry on the Ben Nevis pastoral lease therefore lies firstly in its uncommon occurrence near an early record of one of the largest moa-hunting sites in Otago, if early descriptions are correct. Secondly, it appears from the photographs of the site provided from the recent survey that flakes from tool making may be present at the quarry face, which if confirmed, may mean it is one of only a

handful of porcellanite quarries in southern New Zealand where this activity has been confirmed. It should also be noted that although the moa-hunting site F42/7 had not been relocated by previous surveys, none of these surveys involved test pitting or scraping over the area with machinery to confirm the survival of the site from past gold mining activities, hence it cannot be presumed at present that the site is destroyed.

4.7 Significance of the Recreational Values

The track which runs along the southern boundary of Area 1 provides practical access for south-bound travellers from Doolans Saddle into the Hector Mountains. NGOs have previously expressed a desire for public access to be secured along and across this track.

Likewise the farm track which runs off the Nevis Road onto the ridge to the immediate south of Commissioners Creek provides good access onto this ridge which forms a practical route into the Hector Mountains.

Given its position in relation to the Nevis Road, Duffers Saddle and Watts Rock Area 11 provides a potentially significant recreational experience for travellers entering the Nevis Valley from Bannockburn.

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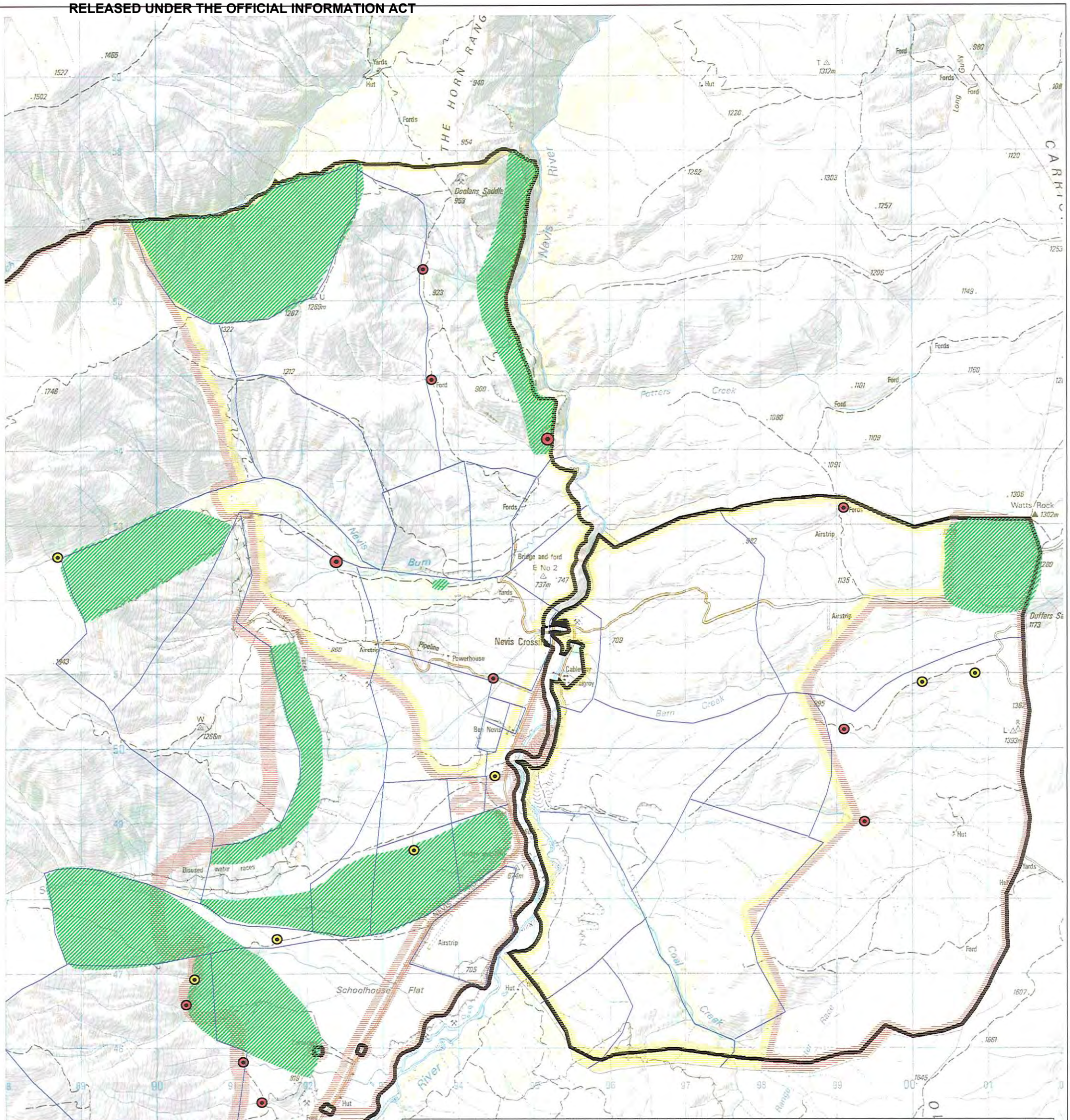

Plan 5
Significant Inherent Values

Existing fencing

Fished sites
- Galaxias spp.
- No fish

Significant area of natural inherent values: ecological, historical & landscape

Previously Recommended outcomes
- Conservation
- Covenant

Property boundary

2000 0 2000 4000 Meters

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