

Perisher Range Resorts Environmental Study









FOR NSW NATIONAL PARKS & WILDLIFE SERVICE



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NSW National Parks and Wildlife Service

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Abbreviations and Acronyms

Col	Commission of Inquiry
DUAP	Department of Urban Affairs and Planning
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EP&A Act	Environmental Planning and Assessment Act 1979
EPAM	KNP Environmental Planning and Assessment Manual (2000)
ESD	Ecologically Sustainable Development
ESP Act	Commonwealth Endangered Species Protection Act 1992
KNP	Kosciuszko National Park
NP&W Act	National Parks and Wildlife Act 1974
NPWS	NSW National Parks and Wildlife Service
(the) Park	Kosciuszko National Park
PoM / POM	Kosciuszko National Park Plan of Management
REP	Regional Environmental Plan
ROTAP	Rare or Threatened Australian Plants
SAOT	Skiers At One Time
SRDP	Ski Resort Development Plan
TSC Act	Threatened Species Conservation Act 1995

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1.1 Purpose of the Environmental Study

This Environmental Study has been prepared on behalf of the NSW National Parks and Wildlife Service (NPWS) for the Perisher Range Resorts, in accordance with the requirements of the Draft Kosciuszko National Park Environmental Planning and Assessment Manual (2000). The Study will form part of the preparation of landuse planning provisions for the resorts area which includes the implementation of the Governments planning approvals for the area under Part V of the *Environmental Planning and Assessment Act 1979*.

The specific aims of the Environmental Study as defined in the NPWS Brief are:

- To gather background information upon which land use decisions can be based within the Perisher Range Resort development areas.
- To provide input into identifying a level of development for the Perisher Range Resorts that is based on the principles of Ecologically Sustainable Development.
- To review available environmental, economic and social data and comment on its adequacy to fulfil the Ski Resort Development Plan requirements (and need for further data generation on this basis).

The preparation of a Ski Resort Development Plan (SRDP) is a condition of approval for the Master Plan EIS proposal to ensure the environmental impacts are minimised and the long-term protection of the area is not compromised. The SRDP is a strategic plan that will outline the objectives, development controls and guidelines which will control development within the resorts area. This Environmental Study has been prepared to provide input to the SRDP on environmental opportunities and constraints within the area.

An important output from this Study is an environmental database in map format. This includes diverse land use, social and environmental data captured in a geographic information system (GIS). The data is important for development planning in the resorts area and will be a useful management tool for NPWS in the longer term.

1.2 Study Area

The study area is the Perisher Range Resorts, contained within Kosciuszko National Park. The Perisher Range Resorts include Perisher Valley, Smiggin Holes, Guthega, Blue Cow and the Link Management Unit. With an area of approximately 690,000 hectares, Kosciuszko National Park (the Park) contains most of the Snowy Mountains located between the ACT and the Victorian border (refer Figure 1.1). The Park comprises a wide range of vegetation communities in the four main physiographic units of alpine, subalpine, montane and tableland. The Park was initially established in 1944 as the Kosciuszko State Park managed by a Park Trust. The Park became a National Park in 1967 when it was placed under the care and control of the NSW National Parks and Wildlife Service. The international significance of the Park was recognised in 1977 when it became a Biosphere Reserve under the UNESCO Man and the Biosphere Program.

Kosciuszko National Park contains the only snowfields in New South Wales of sufficient size and duration to sustain a ski industry. As a result, a number of ski fields and other snow sports have developed in the Park. While such activities initially preceded the establishment of the Park in 1944, the principal resorts have been established and developed to their present size and scale since the growth of skiing as a recreational activity took place in the 1960s-70s.

The Perisher Range Resorts include the previously separate ski areas of Perisher Valley, Smiggin Holes, Guthega and Blue Cow which were amalgamated in 1995 to form the Perisher Blue resort. The main purpose of this Environmental Study is to compile a single document containing information required to assist in determining the location and management of future development and recreational activities in the Perisher Range Resorts to encourage both winter and summer recreational use.

1.3 Role of the NPWS

The NPWS has primary responsibility for the control and management of all activities within Kosciuszko National Park. Those responsibilities derive from three principal sources of legislation, namely the *National Parks and Wildlife Act 1974*, the *Environmental Planning and Assessment Act 1979* and the *Threatened Species Conservation Act 1995*.

1.3.1 National Parks and Wildlife Act, 1974 (NP&W Act)

The NP&W Act vests care, control and management of National Parks in the Director-General of the Service. In particular, the Director-General has responsibility to prepare a Plan of Management for each national park having regard to a series of objectives set out in Section 72(4) of the Act. These include the conservation of wildlife; the prohibition of works which may adversely affect the natural condition or special features of the park; the preservation of historic sites, relics or Aboriginal places; and regulating appropriate uses of the park by the public, lessees, licensees or occupants of land. An overall Plan of Management (PoM) for Kosciuszko National Park acts as the guiding instrument in establishing management objectives and practices in the Park.

1.3.2 Environmental Planning and Assessment Act, 1979 (EP&A Act)

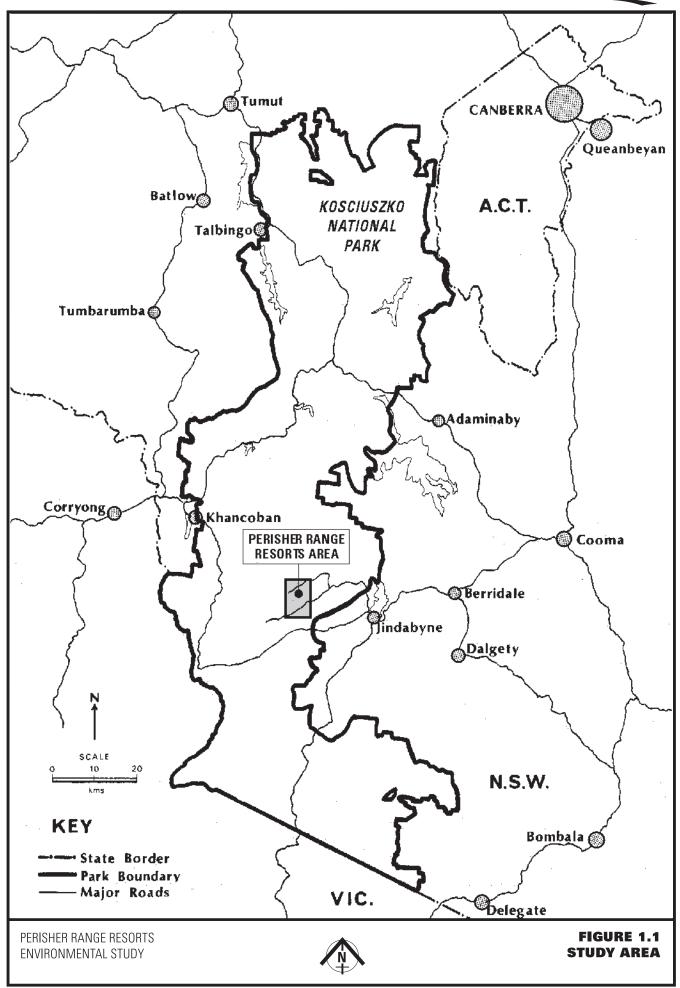
The EP&A Act also applies to development and other activities in the Park. Part 3 of the Act provides for the preparation of local and regional environmental plans and state environmental planning policies as a basis for enabling consent authorities to determine development applications within their areas of responsibility. The Perisher Range Resorts is located within that part of Kosciuszko National Park which is within the Snowy River Shire. The Snowy River Council has adopted a local environmental plan which divides the Shire into a number of zones in which various development activities may be undertaken with or without Council consent or are prohibited purposes.

Under the provisions of the Snowy River Local Environmental Plan 1997, the whole of the national park area within the Shire is included in Zone No. 8 - National Parks and Nature Reserves. Development activities may be carried out in this zone without the consent of Council where they are authorised under the *National Parks and Wildlife Act 1974*. As a result, all such development activities within the Park come under the provisions of Part 5 of the EP&A Act.

The determining authority for development in the Park is the NPWS which has a duty to consider the likely impact of an activity on the environment prior to granting an approval for the activity. Under the Act, the determining authority shall not carry out an activity or grant approval for an activity if the activity is prescribed or likely to significantly affect the environment (including critical habitats) or threatened species, populations or ecological communities or their habitats, unless the determining authority has considered an environmental impact statement and/or a species impact statement prepared in the prescribed form.

1.3.3 Threatened Species Conservation Act, 1995 (TSC Act)

The TSC Act requires the determining authority for an activity to examine and take into account all matters affecting or likely to affect the environment with particular reference to the effect of the activity on threatened species, populations or ecological communities and their habitat.



Where there is likely to be a significant effect, it is necessary to prepare a species impact statement and to obtain the concurrence of the Director-General of NPWS.

1.4 Background to the Environmental Study

1.4.1 Kosciuszko National Park Plan of Management

The Plan of Management (PoM) for Kosciuszko National Park has been progressively updated since it was adopted in 1974. Amendments have occurred in 1982, 1984, 1988, 1994 and 1999.

The current PoM contains a number of sections relating to the management of outdoor recreation opportunities in general and skiing facilities in particular. Amendments to the PoM adopted by the Minister for Environment in May 1999 recognise the amalgamation of the four separate resort facilities into the Perisher Blue resort and provide for the implementation of the development of a village centre at Perisher Valley.

The principal amendments adopted in the 1999 PoM were:

- Public car parking within the resort area is to be maintained at existing levels.
- Private enterprise will be encouraged to provide services and facilities for users to enjoy the Park.
- A village centre at Perisher Valley is provided as an option for future accommodation and services.
- Maximum bed numbers were established for each resort.
- Accommodation could be in the form of privately subleased apartments for year round use.
- Existing bed numbers for all lodges were set out in Schedule 6 of the PoM and included accommodation for guests and staff.

The overall framework for the development of a village centre at Perisher Valley and the increases in bed numbers included in the current PoM derive from a number of detailed investigations and assessments undertaken by NPWS during the past decade. The principal documents which have led to the current PoM are summarised below.

1.4.2 Ski 2000

The Ski 2000 report was prepared by NPWS in 1990 following consideration of a number of detailed investigations relating to estimation of the potential size and expectations of the ski market and likely ski growth scenarios for the period 1989-2005. The principal components of the report were:

- The provision of 987 additional beds as commercial accommodation to be developed as infill within the existing developed areas.
- Additional ski slope development, including a link between Perisher Valley, Blue Cow and Guthega, subject to environmental assessment.
- A range of accommodation types including apartments for use by the general public.
- Non-skiing recreational facilities to improve the range of opportunities for winter and year round use, subject to conditions.

Following consideration of 582 submissions received in respect of exhibition of the Ski 2000 document, draft amendments to the PoM were exhibited in late 1991. More than 2000 submissions were received in respect of the draft amendments. Consideration of the submissions led to the adoption of amendments to the PoM in 1994.

1.4.3 Perisher Range Resorts Village Master Plan EIS, and Associated Documents, 1997

The Perisher Range Resorts Village Master Plan EIS (Kinhill 1997), draft amendments to the PoM and other associated documents were placed on public exhibition between July and October 1997. The main components of the proposed activity involved:

- Development of a village centre in Perisher Valley to contain 800 beds in apartment style buildings.
- Increased apartment accommodation at Smiggin Holes 150 beds.
- Increased beds numbers (116) to be distributed to existing commercial lodges in Perisher Valley and Smiggin Holes.
- Substantial reduction of day parking at Perisher Valley.
- Gradual elimination of beds from Guthega.
- Improvement of infrastructure and remediation of degraded environment at existing resorts, particularly Perisher Valley.
- Provision of substantial amount of commercial space at Perisher Valley and Smiggin Holes.
- Implementation of the additional development over a 5-10 year period.

3123 submissions were received of which more than 2500 expressed concern at the proposed closure of Guthega. The Minister for Urban Affairs and Planning sought independent advice on the proposed development by the establishment of a Commission of Inquiry with terms of reference to:

- Inquire into the environmental aspects, including biophysical, social and economic impacts, from the proposed increase in resort accommodation and associated upgrading of infrastructure in relation to:
 - environmental objectives for the national park generally, and Perisher Range in particular; and
 - the principles of ecologically sustainable development.
- Examine the justification for the proposal in terms of environmental capacity, social objectives and economic viability.
- Advise and make recommendations on the acceptability of the proposals.
- Advise and make recommendations on any modifications to the proposals or additional safeguards or provisions, including management and monitoring systems which are considered appropriate.

1.4.4 Commission of Inquiry Report, 1998

The Commission of Inquiry (CoI) was undertaken by Commissioners W Simpson and W Train during the period February to November 1998. The Commissioners' report (November 1998) contains a detailed commentary on their investigations, which included public hearings in Sydney and Berridale, and numerous recommendations concerning the future development of the Perisher Range Resorts.

The principal findings and recommendations included:

- Ski resorts are an acceptable use in Kosciuszko National Park provided relevant environmental features are appropriately recognised and protected.
- An overall vision for the design ski slope capacity of the Perisher Range as 22,000 visitors on the 10th busiest day.
- Socio-economic considerations need to be factored into the assessment of land use and development as a means to balance considerations relating to the conservation of natural values and areas, scenic quality, ecological integrity and heritage locations.
- The proposed activity will contribute to the social and economic advancement of the State and region and enable increased employment opportunities.
- There is a need for substantial investment in addressing existing environmental problems in the Perisher Range Resorts.
- The existing levels of car parking for day visitors to the Perisher Range Resorts must be retained.
- A Village Centre to accommodate approximately 800 beds is supported subject to design in accordance with the Col findings.
- Guthega Village must be retained due to its unique character and niche market.
- Approximately 120 beds be allocated to Smiggin Holes and Guthega with approximately 400 beds allocated to club and commercial lodges in all resorts.
- Commercial lodges be encouraged to upgrade to a minimum level of 50 beds as recommended in the Price Waterhouse report.
- An Environmental Management Plan (EMP) be prepared for the ongoing environmental management of the Perisher Range Resorts.
- NPWS to review the PoM to enable approval of indoor and outdoor recreational facilities and uses in the Ski Management Units at Perisher to facilitate and encourage use of the resort as a year round destination.

1.4.5 Representations Report, 1999

Following examination and consideration of the Master Plan EIS, representations received on the proposal as well as the recommendations of the CoI, the NPWS prepared a Representations Report which addresses each of the key areas of concern relating to the original proposal and put forward an amended proposal for approval from the Minister for Urban Affairs and Planning. The key elements of the amended proposal are summarised below:

- Within Perisher Valley, the amended proposal will allow for:
 - Approximately 800 beds in apartment / commercial style buildings
 - Retail and commercial space significantly reduced from that originally proposed
 - Associated underground parking for occupants and day trippers
 - Existing car parking levels to be maintained
 - Revised pedestrian and vehicular access plan to ensure efficient circulation
 - Direct visual connection from Front Valley and from Skitube to Mt Piper
 - Landscaping and drainage improvement works
 - Erection of safety and interpretation signs throughout village
 - Development of a fully enclosed waste facility
- Within Smiggin Holes, the amended proposal will allow for:
 - Reallocation of sites SB3, SB4 and SB5 to more environmentally acceptable locations

- Resurface of main car park and introduction of landscaping and drainage measures
- Construction of sealed access road to Smiggins Hotel and adjacent car park
- Development of a fully enclosed waste facility
- Redevelopment of SB1 depending on site contamination issues
- Within Guthega, the amended proposal will allow for:
 - Rationalisation and stormwater management of internal roads
 - Development of a fully enclosed waste facility
 - If additional allocated beds are not constructed within 5 years, the beds will be reallocated back to the Village Centre in Perisher.

1.4.6 Approval of Master Plan and Plan of Management Amendments, 1999

Following consideration of the Col report and a subsequent Representations Report by the NPWS, the Minister for Urban Affairs and Planning granted consent to NPWS to carry out an amended Perisher Range Village Master Plan subject to a number of conditions. The conditions included requirements that no construction of any additional beds was to be undertaken until the PoM was amended and a Ski Resort Development Plan (and Environmental Study) had been prepared and approved.

Concurrent with the approval of the Village Master Plan, the Minister for Environment adopted the 1999 amendments to the Kosciuszko National Park Plan of Management. The amendments provide for the approved resort areas accommodation limit to be set at 10,364 beds. The maximum numbers for each resort in the Perisher Range being 3352 beds at Perisher Valley, 1016 beds at Smiggin Holes, 330 beds at Guthega and 25 beds for essential staff at Blue Cow. A further 174 beds will be made available to the resorts subject to environmental assessment and planning studies.

1.5 Format of the Report

Part 5 of the EP&A Act does not include a statutory requirement for a determining authority to prepare environmental planning instruments in the form of local or regional environmental plans, nor for the preparation of environmental studies as described in Part 3 of the Act. However, Part 5 of the Act does require the determining authority to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment, including any plan of management prepared under the *National Parks and Wildlife Act 1974*.

As a consequence, the Kosciuszko National Park Plan of Management is a key document in establishing strategic planning objectives and specific controls for development and activities within the Park. The NPWS is in the process of preparing a Ski Resort Development Plan as required by the PoM as a means of guiding the future development and management of the existing ski resorts. In order to ensure the SRDP is based on a sound understanding of the area, the NPWS has resolved to prepare an Environmental Study for the Perisher Range Resorts.

The matters to be considered in this Environmental Study have been set out in Schedule 3 of the Draft Environmental Planning and Assessment Manual (NPWS 2000), as follows:

- Regional Context
- Role of the Ski Resort
- Existing Environmental Performance
- Analysis of the Natural Environment
- Analysis of Heritage and Archaeology

- Analysis of Existing Services Infrastructure
- Resort Design Analysis
- Social and Community Services
- Transport and Access
- Ski Infrastructure

In the course of addressing these matters, reference is made to management units in the study area. In most circumstances, the management units are as adopted in the PoM. However, in the case of the vegetation assessment, the study relies on data and mapping originally produced by Perisher Blue P/L.

The balance of this report provides a summary of important environmental, social and economic information derived from a large number of individual studies and reports which have been prepared for a range of issues relating to Kosciuszko National Park and the Perisher Range Resorts during the past decade. Key events during that period which have led to the current study are summarised in the following section.

2.1 Regional Planning Objectives

The Alpine Region in NSW is important as an area of outstanding natural value and as a significant contributor to the State's economy, through tourism, primary industry, water and nature conservation. Located in southern NSW, the Region includes the local government areas of Bombala, Cooma-Monaro, Snowy River, Tumut and Tumbarumba as well as Kosciuszko National Park.

The eastern slopes of the Park are located within the Snowy River Shire which extends from the Murrumbidgee River in the vicinity of Adaminaby in the north to the Snowy River in the south. A plan of the Region, showing the geographic context of the Park, is included as Figure 1.1. The principal settlements with access to the Perisher Range Resorts from Kosciuszko Road are Jindabyne, Berridale and Cooma.

Under the provisions of the *Environmental Planning and Assessment Act 1979*, responsibility for land use planning in the region rests with the Snowy River Council in respect of local planning issues and the Department of Urban Affairs and Planning in respect of regional planning and issues of State significance. A number of planning reports and instruments apply to the management of land use in the region. They are described briefly in the following sections.

2.1.1 Kosciuszko Regional Environmental Plan (Snowy River)

A Regional Environmental Study for the Kosciuszko (Snowy River) Region was initially prepared in 1983 and led to the gazettal of a Regional Environmental Plan in 1986. The preparation of the environmental study and plan were designed to assist in considering the likely regional implications of the rapid growth of winter and summer visitation to Kosciuszko National Park and the likely demand for accommodation and services in areas adjacent to the Park.

The Regional Environmental Plan was updated in 1998 and provides a framework for local decision making in the context of regional and State issues. While the REP does not specifically apply to land within the Park (Clause 2(1)), nevertheless Clause 6(2) states that a public authority proposing to carry out development which does not require development consent, but which has the potential to adversely affect the environment of the region to a significant extent, must consider the aim and objectives of the plan and the planning and development guidelines contained in the plan.

The NPWS has recognised the need to consider such issues in its Draft Environmental Planning and Assessment Manual. The Service has and will continue to apply the provisions of Clause 6(2) in its assessment of any application for an activity within the Park.

The aim and objectives of the Regional Environmental Plan and its planning and development guidelines are summarised as follows:

Aim

The plan aims to provide a framework for environmental planning, development and resource management decisions for the region.

Regional Objectives

The objectives of the plan for land within the Region are to encourage:

- ecologically sustainable development by promoting activities which will result in the protection and maintenance of the ecological resources of the region;
- sustainable economic development that generates a range of employment opportunities and social benefits for the region;
- the maintenance and protection of the natural, cultural, heritage and scenic values of the region;
- the management of the region's water resources in a manner which will ensure these resources are sustainable; and
- the protection of threatened species, populations and ecological communities.

There are a number of regional planning and development guidelines contained within the REP. The guidelines are categorised under a number of key headings relating to the environment, the economy, rural land, urban areas and areas of particular consideration. Guidelines of particular relevance to the development and management of the Perisher Range Resorts include environment, economy and urban areas.

Environment

- maintenance and improvement of water quality as part of an overall strategy for total catchment management;
- maintenance of biological diversity and the protection of places of significance for nature conservation;
- preservation of the natural, scenic and landscape values of the region through appropriate zoning and development controls;
- preservation of various types of wetlands in the region;
- preservation and enhancement of the cultural and environmental heritage attributes of the region;
- protection of people and property from bushfire, instability or flooding.

Economy

- promotion of a year-round tourism and recreation industry;
- encouragement of a year-round regional economic base and employment opportunities.

Urban Areas

- reinforcement the existing urban settlement pattern;
- provision of an appropriate level of infrastructure and social and community services.

2.1.2 Draft Alpine Region Strategy

The Department of Urban Affairs and Planning has published a draft strategy (the Strategy) for the Alpine Region (1998). The purpose of the Strategy is to assist local communities to manage change in the Region as a means to seek out opportunities which will lead to more jobs, better services and a sustainable natural environment for the Region. Unlike the Kosciuszko REP, this strategy is not a legal planning document.

The Strategy contains a vision statement and three objectives which are summarised below.

Vision

The Strategy's vision is to have:

- A healthy and viable community.
- A sustainable natural environment and resource base.
- A strong and diverse regional economy.

Objectives

The broad objectives for the region are:

- To enhance the quality of life for residents throughout the alpine region.
- To stimulate and to diversify the regional economy.
- To conserve and to manage the natural environment of the alpine region in a sustainable and cooperative manner.

The Strategy also contains many policies and actions which are directly relevant to the resorts area, including provisions for settlement, regional economy, the natural environmental, cultural heritage, communication, and education and research.

2.1.3 Snowy River Shire

Under the Snowy River Local Environmental Plan 1997, Kosciuszko National Park is included in a "National Parks and Nature Reserves Zone" in which any purpose authorised under the *National Parks and Wildlife Act 1974* is permissible without consent. Objectives of the Zone are:

- To identify and protect land reserved or dedicated under *the National Parks and Wildlife Act 1974*, and
- To enable development compatible with the use of the land for a national park or nature reserve, which is referred to in and authorised by the *National Parks and Wildlife Act 1974*.

As a result of the above, the Snowy River Council has no direct involvement in the management of land use within the boundaries of the Park. However, the Council has an interest in the development of activities within the Park due to the implications for the provision of accommodation for staff and tourists, and the establishment of retail/commercial, community and social services outside the Park boundaries in the townships and rural areas of the Shire. NPWS and Snowy River Council are currently working jointly on a number of regional projects such as the Regional Waste Facility to be located at Jindabyne and the Commonwealth funded ILAP Closer Relations Program which has a number of joint initiatives.

As indicated in Section 1.3.2, all development in the National Park is required to comply with the provisions of Part 5 of the EP&A Act. As the determining authority, the NPWS has responsibility to consider the likely environmental effects of activities within the Park.

2.1.4 Commission of Inquiry Report

The Col into the Master Plan proposal lead to a vision for the Perisher Range Resort area catering to further tourism and ski field development on the basis that it was consistent with protection of environmental values. The Col indicated that the combined resorts could support up to 22,000 visitors on a peak day and that an additional 1300 beds would be appropriate.

In its consideration of the likely effect of the proposed increase in the number of beds in the Perisher Range Resorts on the regional economy and settlement, the Col came to the following conclusions:

- The social and economic well being of the Alpine region towns is markedly influenced by tourism (including skiing) generated by the natural attributes and recreational activities available in the Park.
- Reduction in the number of visitors to the Park (in particular those involved in snow sports) will adversely impact the social and economic environment of alpine region towns.
- Ski resort competition both overseas and interstate is likely to result in a decline in tourism in the Park with an adverse impact on the socio-economic circumstances of the Alpine towns.
- In the short term such a decline is most likely to be arrested by development of the village centre in the manner recommended by the Commissioners.
- The short term solution will not unduly impact on the social and economic viability of towns in the Alpine region as:
 - the proposed increased number of on-snow beds represents only 5% of total bed stock in the surrounding area.
 - the beds will become available gradually over a period of years.
 - there is likely to be a significant cost differential to users as between apartment type accommodation in the snow and the range and lower cost of accommodation in Jindabyne.
 - the beds are catering for a different demographic in the ski population.
- The extent of commercial floor space proposed in the Village Master Plan is likely to have an adverse economic and social impact on Jindabyne. The Col therefore indicated there was a need to distinguish between floor space required for village centre recreational and entertainment facilities as opposed to that for the sustenance of on-snow accommodation occupants and day visitors, and not to establish facilities which directly compete with businesses in Jindabyne.

The Col stated that there was a need for preparation of a SRDP to redress the absence of any long term strategy for the Perisher Range Resorts and to better coordinate urban design, environmental and economic planning initiatives. The Col indicated that such action must be integrated with the planning and development of the alpine region if the public interest of both the National Park and the Region are to be served.

In addition to the SRDP, the NPWS will also develop a structured environmental management system (EMS) which, among other things, will establish environmental performance objectives and monitoring programs to determine what is a sustainable level of development and use of the resorts area and to confirm the capacity limits envisaged by the Col.

2.2 Relationship of the Perisher Range Resorts to the Kosciuszko Region

2.2.1 Access to the Perisher Range Resorts

The Perisher Range Resorts are located in the southern section of Kosciuszko National Park. Perisher Valley and Smiggin Holes have direct access from Kosciuszko Road (Main Road 286) approximately 35 kilometres to the west of Jindabyne. Severe snow and ice conditions necessitate the use of snow chains during approximately 50% of the winter months. Access to the Perisher Valley and Blue Cow resorts is also available by use of a generally snow-free section of the Alpine Highway to Bullocks Flat which is the lower terminus for the Skitube. Access to the Guthega resort is available from Kosciuszko Road and Guthega Road. The latter is an all-year access route while the Link Road from Smiggin Holes is at present only accessible during non-winter months.

The individual resorts which now comprise the Perisher Range Resorts were originally developed as separate "villages" from the 1950s, with each catering for the needs of particular segments of the ski market. Perisher Valley has the largest range of alpine and cross-country terrain and has become the principal focus of the resort with entertainment and commercial activities. Smiggin Holes has traditionally catered for lower cost accommodation particularly for less experienced skiers while Guthega has provided for a small niche clientele at an isolated location. Blue Cow has been developed more recently as a day use area, serviced by the Skitube with on-site accommodation only for essential staff.

The development of the Skitube and subsequent integration of the resorts enables the whole of the Perisher Range to be accessible to visitors staying at each of the resorts as well as day visitors accessing the area by road and Skitube. Perisher Valley also provides the access point to Charlottes Pass by oversnow vehicles.

Cross-country skiing trails are concentrated in the Perisher Valley and Smiggin Holes areas where there is a range of trails catering to intermediate and advanced skiers over varying lengths.

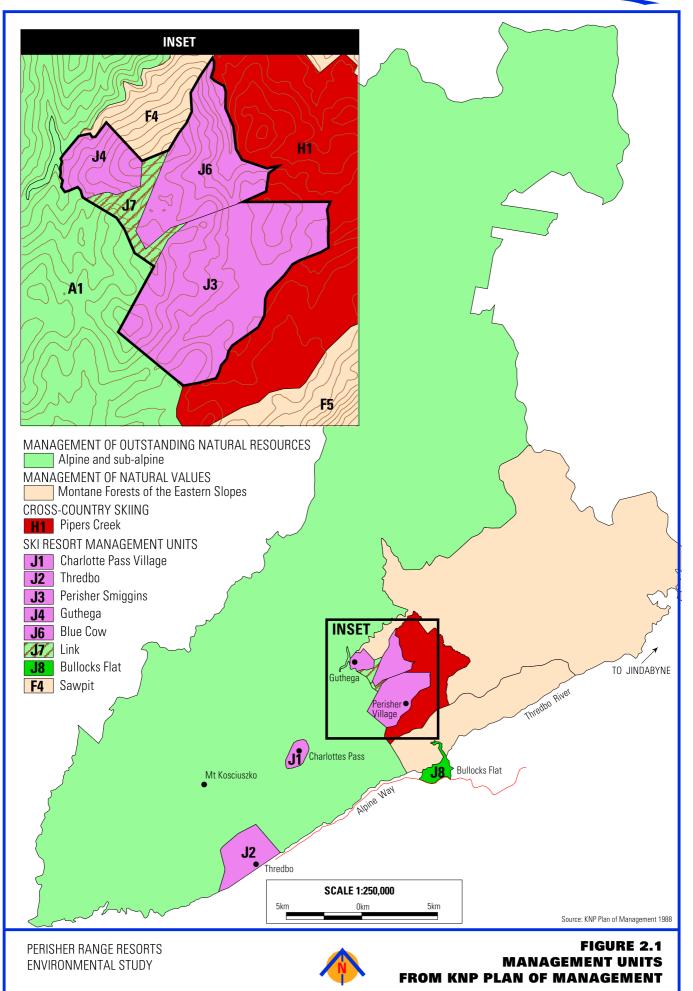
2.2.2 Relationship of the Perisher Range Resorts to Management Units in Kosciuszko National Park

The Kosciuszko National Park Plan of Management contains a map which subdivides the Park into several management units (refer Figure 2.1). Each unit has a distinct environmental character in the Park and forms the basis for park management objectives and policies. The principal management categories are:

- A. Management of Outstanding Natural Resources
- B. Management of Special Scientific Values
- C. Management of Natural Values Montane Forests of the Deep Northern Valleys
- D. Management of Natural Values Sub-Alpine Plateau
- E. Management of Natural Values Montane Forests of the Western Escarpment
- F. Management of Natural Values Montane Forests of the Eastern Slopes
- G. Management of Natural Values Southern Montane Forests and Dry Woodlands
- H. Management of Skiing Facilities Cross-country
- I. Snow Recreation Area
- J. Ski Resort Management Units

Kosciuszko National Park is the only area in New South Wales that caters for skiing and other snow sports. As stated in the PoM, the challenge for the NPWS is to allow the development of a strong and vibrant ski industry, while protecting the important natural values of the Park. As a result, planning for the ski resorts must reflect the wide range of views in the community relating to the development and management of the ski resorts and the protection of the natural environment.

One of the outcomes from the Scientific Forum (1997) indicates that the "footprint" of the resorts area is encroaching into the surrounding management units (K1) through impacts such as a



reduction in water quality, spread of weeds and feral animals, and trampling of vegetation. There is a need to protect both the visual and biological integrity of these surrounding areas and the PoM states that "alpine skiing and related facilities which are likely to have a significant impact on the landscape as viewed from the Kosciuszko Management Unit (K1) will not be approved" (s7.3.2).

With continued growth of visitation to the resorts area and the associated demands for alpine skiing, there is potential for incremental changes to the environment of adjoining management units. Careful planning and management aimed at protecting the ecological integrity of such areas is a high priority of the PoM and avoiding degradation should be essential in planning for sustainable development of the Perisher Range Resorts.

Management of Cross-country Skiing

The PoM recognises that cross-country skiing is a legitimate and important recreational use of the Park. The following objectives apply to cross-country skiing:

- Develop management units with a special emphasis on providing facilities for cross-country skiing.
- Standardise and provide facilities in other appropriate snow covered management units.
- Retain remote areas for cross-country skiing.
- Integrate cross-country skiing with other winter activities in a manner that does not cause conflict.
- Consult with user groups as a basis for improving all aspects of the management of crosscountry skiing.

The three management units of Pipers Creek (H1 – 1720 ha), Dry Dam (H2 – 910 ha) and Three Mile Dam (H3 – 2700 ha) have been identified as the principal areas for providing facilities for cross-country skiing. Of these, the Pipers Creek area adjoins the Perisher Valley-Smiggin Holes resorts and is the subject of the Perisher Range Cross-country Ski Development Plan (refer section 11.2).

The Pipers Creek Management Unit comprises approximately 32% of the three management units identified for cross-country skiing and approximately 2.5% of the total area of the Park.

Management of Alpine Skiing

Alpine skiing (including snowboarding) is the predominant recreational activity for winter visitors to Kosciuszko National Park. Based on market research by KPMG Management Consulting (1998), the NSW ski resorts located in Kosciuszko National Park have about 59% of the market share (991,000 skier days in 1997) of Australian resorts while the Victorian resorts have 41% (665,000 skier days in 1997). During the period 1995-97, Perisher Blue had approximately 64% of the New South Wales skiing market compared with approximately 29% at Thredbo, less than 5% at Mt Selwyn and less than 3% at Charlottes Pass.

The PoM identifies six ski resort management units for alpine skiing, other snow recreation and appropriate summer recreational use. A further two units are nominated for access and servicing requirements for alpine skiers. The locations of the units are indicated on the map in Figure 2.1. The names and areas of the units are set out in Table 2.1.

Unit Ref.	Management Unit	Area of Unit	Max Beds
JI	Charlotte Pass Village	790ha	607
J2	Thredbo	959ha	4810
J3	Perisher Valley – Smiggin Holes	948ha	4368
J4	Guthega	452ha	330
J5	Mt Selwyn	200ha	50
J6	Blue Cow	344ha	25
J7	Link	106ha	-
J8	Bullocks Flat	300ha	-
	Unallocated Beds		174
	TOTAL	4099ha	10364

Table 2.1 Ski Resort Management Units

The Perisher Range Resorts comprise Units J3, J4, J6 and J7 in the above table with a total area of 1850 hectares and a maximum number of 4897 beds allocated to the resorts. The Perisher Range Resorts therefore comprise approximately 45% of the Ski Resort Management Units within the Park and approximately 2.7% of the total Park area.

2.3 Land within the Ski Resort which Contributes to the Biodiversity of the Region

Biodiversity is defined under the NSW Biodiversity Strategy as "the variety of life forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form" (NPWS 1999). The wider Kosciuszko National Park provides environmental conditions for a diverse and complex range of ecosystems and is of national and international significance in terms of flora conservation and genetic resource preservation. The Park has been previously recognised by the International Union for the Conservation of Nature as one of six Australian sites of plant biodiversity and one of 167 throughout the world (Good 1992). The Park is located within the Australian Alps bioregion, as defined by Thackway and Cresswell (1995) in the Interim Biogeographic Regionalisation for Australia.

In a general context, alpine vegetation occupies some 250km² in NSW. The vegetation is highly distinctive, is restricted in an Australian context and has a relatively high degree of endemism. The Perisher Range Resorts form part of this vegetation complex and contain many areas that have been identified as being of state, national and international importance. In particular, the bog and fen communities surrounding Perisher Creek have been identified as being of national significance (Ecology Australia 2000). The ecological features which are found in the resort areas are not widespread in Australia or even in the Park. The resorts have been developed in locations with some very important habitats, the significance of which was not understood at the time of early development.

Approximately 60 rare, endangered or vulnerable plant species (ROTAP and TSC Act) are known to be present in Kosciuszko National Park. Of these, around 20 have been found within the resorts area. In addition, the resorts area contains vast areas of significant plant communities including the Snow Gum Woodland, bog and fen communities, as well as Podocarpus boulder heath which provides habitat for the threatened Mountain Pygmy-possum *Burramys parvus*. Of the known population of the Mountain Pygmy-possum within the Park, approximately 50% is contained within the resorts area (NPWS Draft Recovery Plan 2000). Therefore, notwithstanding the small total area of the Park affected by resort development, these areas do have special ecosystem values. Indeed, the Scientific Forum (1997) concluded that the ecosystems of the resorts area have a very restricted occurrence and

are unlike most of the Park's other snowfield areas. As such, this is another key consideration in determining what is ecologically sustainable development.

2.4 Level of Summer and Winter Tourism Demand

The Second Edition of the Kosciuszko National Park Plan of Management (1988) refers to a broad visitation level of two million visitors per year, more or less evenly split between winter and summer. The more recent publication "Kosciuszko Resort Management" (1994) refers to a total visitation of more than three million visitors per year with approximately 60% occurring in winter, mainly for snow related activities, and 40% in summer.

The report "Australian Alps National Parks – Visitor Monitoring Strategy" (1994) indicates that there are approximately 29 public access points into Kosciuszko National Park, of which 9 are sealed roads, 12 are unsealed roads and 8 are walking tracks or horse trails. Such variety of entry into the Park clearly creates great difficulty in monitoring the number of visitors.

Visitor Entrance Station Statistics collected by NPWS for the period 1992 - 1995 are summarised in Table 2.2 to indicate approximate numbers of visitors for the summer (October – May) and winter (June – September) periods. Data for the visitor entrance stations are collected at the Park entry gates located on Kosciuszko Road to Perisher, Alpine Way to Thredbo, Mt Selwyn (mainly winter), at the Skitube from Bullocks Flat to Perisher and Blue Cow and ticket sales from ancillary outlets.

Year	Summer		Winter		Total Visitors
real	By Vehicle	Skitube	By Vehicle	Skitube	
1992	246857	31273	621068	271318	1170516
1993	234710	26911	524912	213213	999746
1994	245853	40095	647991	284431	1218370
1995	236929	46609	694755	335258	1313551

Table 2.2 Visitor Entry Statistics 1992-1995

Based on the above data, winter use (the four months of June to September) of the sections of the Park accessed by these entry stations makes up approximately 75% of the year round use. Peak summer use during December and January is less than 10% of the annual usage, while the remaining six months comprise approximately 15% of Park visitation.

In its report, the Col assessed the total number of visitor days in 1995 as 3.8 million in winter and 680,000 in summer, based on estimates of the average length of stay from the KPMG report (1994).

During the summer months the main types of activities undertaken in the Park include scenic driving, picnicking, cycling, horse riding, canoeing and rafting, vehicle-based camping, pack camping, bushwalking, climbing and abseiling, caving, fishing and nature study. Ancillary activities such as golf, tennis, swimming and fitness programs at the AIS centre and attendance at a number of music and cultural festivals are also available at Thredbo. The high summer use of activities at Thredbo, with its compact village and range of summer activities and events, is not currently duplicated at the Perisher Range Resorts. Summer use of the Perisher Range Resorts is largely limited to day users for hiking and sight seeing.

During the winter months the principal forms of activity include downhill (Alpine) skiing and snowboarding (72% of day visitors), cross-country skiing (10%) and tobogganing and sight seeing

(10%). Most winter visitors come from New South Wales and the ACT. The Col report (1998) reviewed past growth trends for winter activities in the Park and estimates for likely future growth of snow sports. The Col noted that while high annual rates of growth occurred during the 1970's and 1980's, the situation in the 1990's changed resulting in low to static growth in alpine sports.

A number of reports have attempted to assess likely future growth scenarios for ski demand (Travers Morgan 1989; Access Economics 1990; KPMG 1994, 1998). These reports have indicated a likely growth in demand in the order of 2.0-4.6%. However, recent assessment of trends in the NSW and Victorian Alps suggests that demand is at a very low or static level. Factors influencing recent trends include lack of available on-snow apartment-style accommodation, marketing of Victorian and overseas resorts, variable snow conditions over a number of seasons and non-participation in skiing.

A comparison of on-snow accommodation between the NSW and Victorian alpine resorts found that up to 40% of accommodation at Thredbo and the Victorian resorts was in the form of apartments whereas the accommodation at the Perisher Range Resorts is equally split between commercial lodges and hotels and club lodges. Surveys undertaken by Perisher Blue P/L between 1995-97 found that two thirds of respondents preferred self-contained apartments.

The KPMG Management Consulting Market Demand Study (1998) indicated that Perisher Blue had approximately 39% of the total Australian skier market and 65% of the NSW skier market in 1997. That share was expected to drop to 30% of the Australian market and 58% of the NSW market by 2000 due to the aggressive marketing strategies of domestic and overseas competitors, lack of on-mountain accommodation and insufficient diversity of recreational activities (particularly for non-skiers) at Perisher Blue.

The main planning implication which arises from the apparent imbalance in seasonal tourism demand is the need for more focus on attractions and opportunities to encourage increased summer use of the resorts.

2.5 Settlement Projections

Snowy River Shire contains the township of Jindabyne, which is the principal "gateway community" and service centre for Kosciuszko National Park. A range of other tourist and community services is also provided at Berridale and Cooma.

The estimated permanent population of Snowy River Shire increased from 5554 persons in 1991 to 6248 persons in 1996 – an annual increase of 2.4%. By contrast, the population of neighbouring Cooma-Monaro remained relatively static during the same period with a small annual increase of 0.2% to a 1996 population of 9721 persons.

The increasing population of Snowy River Shire is largely attributed to the increasing importance of year round tourism associated with Kosciuszko National Park and the recreational attributes created by the Snowy River Hydro Scheme. The level of importance of winter visitation in Snowy River Shire is put into perspective by the actual population count of 17697 on Census night (6 August 1996) compared with the estimated permanent population in the Shire of 6248 persons.

Approximately half of the permanent population of the Shire is estimated to live in the Jindabyne Post Code Area (Martin and Associates, 1997). On that basis, Martin estimated the population of Jindabyne at approximately 2800 people in 1991 and 3800 in 1997.

The age profile of the population in Snowy River Shire is heavily biased towards the 29-40 age group. The median age of the population was 28 years in 1996. There is also a severe gender imbalance with

the proportion of females to males at 81:100 compared with the NSW average ratio of 101:100. These imbalances are likely to be a reflection of the emphasis of occupations in the construction and tourism industries and the trend for young people (particularly young women) to seek social, educational and career opportunities away from home.

Martin and Associates (1997) have estimated that the ratio of jobs to beds in the Park is approximately 0.60:1. On that basis the addition of 1300 beds at the Perisher Range Resorts could lead to the requirement for an additional 780 jobs for which accommodation would be required. A survey of seasonal workers (Martin and Associates 1997) found that nearly 60% live at Jindabyne, 15.2% in rural areas of Snowy Shire, 11.4% at Thredbo, 5% at Perisher and 0.8% at Berridale. As it is unlikely that a substantial amount of additional employee accommodation will be provided in the Park, due to bed limitations and the high cost of accommodation, Jindabyne will continue to provide an increasingly important location for accommodation for both the seasonal and full time workforce required to operate the Perisher Range Resorts.

A survey of satisfaction levels of accommodation available to seasonal workers was undertaken by Martin and Associates (1997). The survey produced a variety of results. Around 70% rated accommodation as above average while 30% considered it to be below average. Principal concerns related to cost and quality of accommodation and value for money.

A planning study of Jindabyne (GHD 1997) indicated that there were 1208 dwellings located in Jindabyne in 1991 of which 22% were in the form of detached dwellings, 18% were semi-detached housing, 49% in flat buildings and 10% in caravans and other buildings. The 1996 Census records 2853 occupied private dwellings, 1203 unoccupied private dwellings and 332 non-private dwellings in Snowy River Shire.

Martin (2000) estimates a demand for approximately 40 dwellings per annum at Jindabyne to satisfy current growth rates. The development of the additional 1300 beds at the Perisher Range Resorts may lead to an additional demand for accommodation for both long and short term residents. While Jindabyne is capable of accommodating additional growth for the next five to ten year period, based on land availability identified in the GHD report (1997), longer term housing needs may need to be accommodated elsewhere. Snowy Shire Council has indicated that it intends to carry out further strategic planning studies over the next three year period as part of its process of identifying locations for longer term growth in the Shire.

On the basis that additional beds within the resorts area could lead to increased residential housing demand in Jindabyne, the main planning implication which arises is the need for a Jindabyne / KNP settlement strategy to be prepared.

2.6 Commercial and Employment Projections

The "Regional Employment Profiles for South East NSW" (1999) reports that Snowy River Shire's business profile has heavy emphasis on agricultural and tourist businesses. The principal percentages of business sectors are agriculture 32.6%, hospitality 22.4%, retail 11.7% and construction 8.2%.

The Shire's employment profile is dominated by the Hospitality sector which employed approximately 2400 (16.7%) employees in 1996. Other significant employment sectors are Business Services, Retail and Wholesale Services, Transport and Construction Sectors. The unemployment rate is at a level of 2-4% (1997-98) compared with non-Metropolitan rates of 9-11% elsewhere in the State.

The further development of additional accommodation at Perisher Range Resorts is expected to create further employment opportunities in the hospitality, construction, business services, transport and retail

sectors. The decision by government not to provide significant additional retail/commercial space within the expanded resorts area is expected to be of particular benefit to Jindabyne. The concentration of retail/commercial activities at Jindabyne will provide services to visitors to the Park as well as to the majority of employees who will be engaged in providing services to the resorts, while resident in Jindabyne.

Snowy Shire Council has had preliminary discussions with a number of landowners proposing to establish additional retail/commercial facilities within Jindabyne to cater to existing and future demands.

The main planning implication associated with future commercial development is for the SRDP to focus on services essential for day visitor needs and thereby ensure minimal adverse impact on business and employment in Jindabyne.

2.7 Quantification and Management of Visitation

Recent levels of visitation to Kosciuszko National Park and the Perisher Range Resorts are provided in Section 2.4. As indicated, data from the entrance gates and Skitube ticket sales indicate that up to 75% of visitation to this part of the Park occurs during the four winter months of June to September. Almost a third of the visitation during that period is by use of the Skitube to Perisher Valley and Blue Cow.

The design ski slope capacity of the Perisher Range Resorts is estimated at 22,000 for the 10th busiest day (Perisher Blue P/L 2000). However, as stated in the Col, it is yet to be established, having regard to environmental constraints, necessary access and transport improvements and the economic interests of relevant stakeholders whether attainment of this design capacity is possible.

Main access to the Perisher Range Resorts is by road along Kosciuszko Road to Smiggin Holes, Perisher Valley and Guthega. Car parking at these locations is principally for day use only with a restricted capacity. The Col found that the current availability of car parking at the resorts is in keeping with the capacity of Kosciuszko Road. The Col recommended that as no further upgrading of Kosciuszko Road is to be undertaken, the balance between road capacity and the amount of car parking for day use visitors in the resort areas be maintained.

Future access to the Perisher Range Resorts will therefore be dependent to an increasing degree on use of the Skitube as additional bed capacity is created in accordance with the bed release program and projected ski slope capacity. Investigations of potential increases in Skitube capacity indicate that future winter visitation, based on the proposed increase in bed numbers, is capable of being accommodated with an increase in the frequency and capacity of the rail service. This is capable of being achieved at modest cost through acquisition of additional rolling stock and with no alterations to the platforms or internal design of the Skitube.

While there are indications that summer use of the Park is increasing, the transport and accommodation infrastructure is underutilised in summer and is likely to remain so for the foreseeable future.

The Col envisages up to 22,000 visitors to the Perisher Range Resorts on peak days. The main planning implication associated with this is the need to establish a defined monitoring regime that can show if the environment can sustain further visitor growth.

2.8 Bed Release Program within the Park

As indicated in Section 2.1 the approved bed capacity for the Perisher Range Resorts is set out in the 1999 Amendments to the Kosciuszko National Park Plan of Management. The maximum bed numbers for each resort are shown in Table 2.3.

Resort	No. of Beds
Perisher Valley and Smiggin Holes	4368
Guthega	330
Mt Blue Cow – essential staff only	25
Additional Allocation to be determined	174
Total	4897

Table 2.3 Maximum Bed Numbers

A bed release program has not yet been determined. However, it will be based on the development of a village centre in Perisher Valley with approximately 800 beds. The majority of these beds would be in the form of self-catering apartment accommodation for which there is a perceived need at Perisher. The remainder of the beds would be allocated to existing commercial and club lodges. The Col concluded that it would be desirable for commercial lodges to be given priority for allocation to reach accommodation levels of 50 beds on the basis of commercial viability reasons.

A detailed bed release program has not been finalised. It will be dependent on the adoption of the Ski Resort Development Plan for the Perisher Range Resorts.

2.9 Transport and Access

Access to the resorts area is provided by Kosciuszko Road and the Alpine Way (Skitube from Bullocks Flat). The Kosciuszko Road from Jindabyne is within the Park for most of its length and carries up to 2500 vehicles per day each way on a peak day (900 vehs/hr). At present, the capacity of Kosciuszko Road matches the peak 2.5 hour morning and evening demand, the capacity of the carparks at the villages and the entry rate for these carparks. The Col found that this balance should be maintained and any further works proposed for Kosciuszko Road should be for safety and maintenance reasons only. For environmental reasons, the Col also concluded that no further works should be undertaken on Kosciuszko Road for capacity enhancement. Most stakeholders are of the opinion that further road improvements to Kosciuszko Road such as the provision of additional overtaking lanes, chain fitting bays and intersection widening would exacerbate environmental problems as a result of the construction works and the increased usage of the road by vehicles. In any case, capacity will be restricted during winter when adverse weather conditions, and the need to fit chains, reduces actual capacity to well below the theoretical capacity.

The Col found that further work was required in respect of the Master Plan EIS to justify the reduction of day parking spaces and provision of overnight parking for new accommodation contrary to the existing policy of no overnight parking. Similarly, further work is required to assess the option of providing a rail link or extending the Skitube from Bullocks Flat to Jindabyne.

The Col recommended that a traffic management and information system should be installed on Kosciuszko Road east of its intersection with the Alpine Way. This system would advise on the conditions on Kosciuszko Road and status of car parking within the resorts area, and also the conditions on the Alpine Way and status of car parking at Bullocks Flat. Further information on traffic and transport issues is contained in Section 10 of this report.

2.10 Implications for Ski Resort Development

The following planning implications can be drawn from the foregoing discussion on the regional context of the Perisher Range Resorts:

- All planning must stress the need for protection of the internationally important environmental values of the Australian Alps National Park.
- Any development of the resorts area must acknowledge the international conservation significance of these features and plan accordingly.
- Development planning for the resorts area must be built upon the principles of Ecologically Sustainable Development.
- A formal environmental management system is required in order to monitor the changes associated with future land use and development in the resorts area and to confirm the level of development that is ecologically sustainable.
- Development planning for the resorts area needs to ensure it does not detract from the economy and growth of nearby centres, particularly Jindabyne. This may include a reduction of the commercial floor space within the resorts area as originally proposed in the Master Plan.
- The Skitube is to handle the extra transport demand to the resorts area, with no upgrading of Kosciuszko Road other than for safety improvement.
- NPWS need to participate in the settlement strategy and other regional and state government planning initiatives in the area.
- There is a need for further scientific research of the impacts of the ski industry to guide future decision making.

3.1 Principal Features of the Perisher Range Resorts

The Perisher Range Resorts area is the largest ski field in Australia with a skiable area of 1250 hectares ranging from 1680m at Smiggin Holes to 2054m at the top of Mt Perisher. Approximately 34.5 hectares of the slopes are currently serviced by snow making equipment. The ski slopes are serviced by 52 lifts, of which 12 are chairlifts and the remainder surface lifts (T-bars and J-bars). The existing total lift capacity has been estimated at 10,046 "skiers at one time" (SAOT). For planning purposes, the number of skiers on the "design day" (tenth most busy day in the season) has been estimated to be 10,000 people, with a peak in the order of 13,000. Perisher Blue P/L has prepared a Ski Slope Plan (2000) in which it provides for a design day capacity of 15,500 skiers. At a low growth rate of 2.0 percent per year, this design day would be reached in about 2021. At the high rate of 4.6 percent, this figure would be reached by 2014 (i.e 15 years).

3.2 The Role of the Ski Resort in the National Park

Skiing and snow sports became an important activity in the then Kosciuszko State Park during the 1950s and 60s largely as a result of the improvement in access to the area during construction of the Snowy Mountains Hydro-electric Scheme. All of the resorts with on-site accommodation currently contained within the Perisher Range Resorts, with the exception of Blue Cow, were well established by the time that the Park was placed under the control of NPWS in 1967. As Kosciuszko National Park contains the only viable ski fields in NSW the continuing use of the Park for skiing and snow sports was accepted as a legitimate recreational activity. Management of snow sports and the ski resorts has been included in successive Plans of Management for the Park. The Col (1998) confirmed that ski resorts are an acceptable use in Kosciuszko National Park and not in conflict with its designation as an international Biosphere Reserve provided relevant environmental features are appropriately recognised and protected.

The current PoM (1988, as amended in 1994 and 1999) establishes a number of management practices aimed at ensuring that the ski resort is developed and managed in a manner which recognises its location within a National Park. The principal management practices, which define the role of the ski resort, are summarised as follows:

- Skiing and snow sports are recognised as legitimate outdoor recreational activities in the Park. General management objectives for outdoor recreation are:
 - to provide opportunities for visitors to use, understand and enjoy the Park consistent with the overriding objective of preserving the unique or outstanding scenery or natural phenomena;
 - to minimise the loss of conservation values that may occur in the trade-offs between use and protection;
 - to provide all visitors with a wide range of opportunities for appropriate use of the Park;
 - to ensure that recreation and other visitor activities do not have an unacceptable impact on the irreplaceable natural assets of the Park;
 - to provide suitable access and visitor facilities for different activities in appropriate parts of the Park;
 - to ensure that activities are consistent with the objectives on management for each part of the Park;
 - to ensure that facilities are used for their intended purpose, and that incidental uses do not compromise other Park values and their intended use.

- The Perisher Range Resorts and associated cross-country skiing areas have been placed in a number of Management Units which are described in Section 2.2 of this report. The main policies relating to the role of the Perisher Range Resorts are:
 - provision of a range of alpine skiing opportunities (from beginner to advanced) to meet market demand;
 - restriction on the amount of on-site accommodation to be provided within the resort area;
 - encouragement of the provision of opportunities for summer visitors to the resorts to use, understand and enjoy the natural and cultural features of the Park;
 - the preparation of a Ski Resort Development Plan for the resorts area as a means to ensure that resort services are upgraded and provided to a high environmental standard.

The future development of a village centre at Perisher Valley will provide a wider range of accommodation types at the ski resort. This will not only help to satisfy winter demand for self-catering accommodation, but will also encourage extended visitation to the resorts area at other times of the year. Such additional summer and off-season usage will be dependent on the provision of a range of ancillary activities, including the provision of a broader range of hiking tracks and other ancillary outdoor recreational activities (appropriate to the National Park) sufficient to encourage use of the area other than during the winter months.

The Col concluded that the development of year-round activities could be encouraged at the Perisher Range Resorts in an environmentally satisfactory manner, subject to efficient management and monitoring of activities.

The current PoM therefore provides for a continuing role for the Perisher Range Resorts for winter skiing and snow sport recreational activities coupled with an encouragement for year-round use to take advantage of the range of accommodation and ancillary retail/commercial services which are provided at the resorts. Such recreational and visitor use activities are to be developed and managed in an environmentally acceptable manner with continued monitoring in order to minimise their impacts on the environment.

Such a role is seen to be supportive of the economic and social well being of the region and, in particular, to provide an important contribution to the year round provision of employment opportunities in the region as a whole.

3.3 Implications for Ski Resort Development

The main planning implications relating to the role of the Perisher Range Resorts within the Park are:

- Ski resorts are an acceptable use in the Park and need not be in conflict with its designation as an International Biosphere Reserve provided relevant environmental features and conditions are appropriately recognised and protected.
- Plans for the development of the resorts area should provide opportunities for enhanced summer use in conjunction with other locations such as Jindabyne and Charlottes Pass. Because of its distinctive setting and attributes, the summer role of the Perisher Range Resorts should contrast to that of Thredbo.
- Any promotion of summer use must be efficiently managed and monitored so as to avoid adverse impact on the environment.
- There is a need for integration of the cross-country skiing area in the southern part of the Park with alpine skiing, facilities and activities.

The effects of development, use and operations within snowfield lease areas can be difficult to quantify, but the cumulative impacts of incremental change must be considered when seeking to conserve natural ecosystem integrity. As a first attempt to quantify the impacts of the Perisher Range Resorts on the surrounding ecosystems, NPWS undertook an Environmental Review (1996) as part of the Perisher Range Master Plan. The purpose of the Environmental Review was to identify any existing environmental problems associated with the management of the resorts, and to establish remedial measures to be implemented. The Environmental Review also provides baseline data and information against which future environmental audits can be compared. The Review was undertaken as the first step towards establishing an environmental management Systems – Specification with Guidance for Use.

The Review assessed the environmental management performance for basic environmental issues upon which development is usually regulated, and included soil erosion, stormwater management, weed infestations and watercourse impacts. It revealed extensive environmental degradation which requires remediation. At the time of the Review, the estimated cost of the remediation required was \$40M.

The Review did not attempt to review more complex ecosystem effects, such as the significance of interventions in the natural water cycle and catchment processes, impacts beyond the lease boundaries, transient environmental impacts such as noise and air pollution, or impacts on soil structure.

4.1 Key Environmental Performance Issues

The Environmental Review examined each issue within the resorts area and identified those which posed the greatest risk and required remedial measures in the short term. The major environmental issues identified in this report are summarised in Sections 4.1.1 to 4.1.7 below.

Overall, the Environmental Review demonstrates that best practice environmental management has not been achieved in respect of various key environmental factors. Indeed, environmental performance is well below reasonable community expectations considering the location of the resorts within the Park. It was found that there is no structured nor documented environmental management system (refer Section 4.3) nor any appropriate funding to carry out basic works. The Col stated that significant works are required to raise the environmental performance of the resorts area to an acceptable standard.

Notwithstanding the many environmental studies that are already available, an important shortcoming of relevance to future environmental performance in the resorts area is the absence of comprehensive environmental baseline data. There will need to be a significant effort to develop a reliable and focused data set to serve as reference against which environmental change can be detected and also attributed to existing and new development (and resort area use by visitors). In determining what constitutes baseline conditions, attention will need to be given to the relevance of past activities in the Park such as grazing, and how they might influence measurement of environmental performance in the future.

4.1.1 Erosion and Sedimentation

Incidents of erosion and sedimentation were found to occur widely throughout the Perisher Range Resorts. Erosion problems tend to be closely linked with sites subject to other human disturbances and can potentially devastate a site due to the steep slope, thin soils and high water table which characterise the study area. It was discovered that a major source of sediment is the unsealed roads and carparks around the resorts. In many of the cases, runoff is eroding the unsealed surface or road edge and transporting the sediments (and other pollutants) into nearby waterways.

4.1.2 Material Storage and Stockpiles

Material storage, stockpiles, dumping and vehicle storage were all found to be major problems throughout the resorts area. These activities impact on the environment through degrading water quality (from runoff), disturbing natural habitat and vegetation, creating extensive visual amenity problems and potential threats to public safety.

4.1.3 Fauna Management

The Environmental Review identified the issues of feral animal management and habitat clearance as the two most important issues for fauna management. Foxes, rabbits, cats and starlings were found to occur throughout much of the study area and were associated with sites of human disturbance which provide habitat and food sources that may sustain feral animals through the winter. Feral animals impact on native species through predation and competition for resources. Resort developments also provide a corridor for the spread of exotic flora into undisturbed areas. Weed species such as Yarrow and Pattersons Curse were found to be prevalent in disturbed areas around the resorts area, often competing with native revegetation.

4.1.4 Hydrocarbon and Chemical Management

Hydrocarbons and chemicals were found to be inappropriately stored and controlled at a number of locations in the study area, including workshops, vehicle storage areas, development sites, accommodation, ski infrastructure and depot facilities. At a number of the locations, hydrocarbons and chemicals were actively or potentially likely to leak into the surrounding vegetation and watercourses.

4.1.5 Water Quality Management

Water quality management issues were found to be present at a number of locations, primarily resulting from problems of sedimentation, pollution, excess nutrients and rubbish dumping. Localised infestations of algae and weeds may be symptomatic of pollution and excess nutrients in the watercourse. Instances of erosive processes in the vicinity of watercourses were found to be widespread throughout the resorts area.

4.1.6 Slopegrooming and Construction Activities

Slopegrooming and construction activities raise a number of environmental issues including rehabilitation, water quality impacts, sediment loss, creation of rubbish and materials, access impacts, potential sources of pollutants and issues associated with unapproved works.

4.1.7 Waste Management

The assessment of waste management activities indicated a number of environmental and planning issues which need to be resolved, including appropriate management of waste transfer and storage facilities (including oversnow transfer of wastes), windblown litter and landfill management. The removal and treatment of sewage waste is also a major environmental issue in the resorts area. Sewage is treated in plants at Perisher Valley, Charlottes Pass and Sawpit Creek and the effluent is discharged into surrounding wetlands before entering adjacent watercourses. Mild to moderate impacts on aquatic fauna were detected on occasions in the period 1993-1997 below the Perisher sewage treatment plant.

4.2 Remedial Measures

The Environmental Review undertook an assessment of the above issues and proposed effective remedial measures to control both the incidence and severity of their occurrence. The remedial measures are summarised below for each identified issue. As previously mentioned, at the time of the Review, the estimated cost of the remediation required was \$40M.

4.2.1 Erosion and Sedimentation

Many of the occurrences of erosion (and sedimentation) throughout the area could be eliminated or controlled through simple management practices including the following:

- Initiate and maintain appropriate sediment and environmental controls along drainage lines.
- Prohibit the use of cars during marginal conditions.
- Maintenance and upgrading of roads to be regularly planned.
- Implement guidelines for construction of access roads and carparks.
- Conditioning development approvals to ensure sealed carparks are constructed for any new development in the Park.

4.2.2 Material Storage and Stockpiles

The Environmental Review found that policies to regulate designated storage areas and stockpiles would be the most effective way of controlling this issue. The following remedial actions were proposed:

- Review and set guidelines on storage and disposal in the resorts area.
- Enforcement of NPW Act 1974 and PoM provisions relating to illegal dumping and storage.
- Develop guidelines within one year to Best Practice standard.
- Employ appropriate safeguards preventing runoff from stockpiles entering watercourses.
- Rationalise use of temporary stockpiles.

4.2.3 Fauna Management

Effective remedial measures for the management of native fauna and flora include the following:

- NPWS feral animal management activities and planning to extend to resorts area.
- Consider strategies to control feral animals in development assessment and approval.
- Incorporation of resort areas into NPWS weeds management plan.
- Weed eradication program.
- Education campaign in resorts area.
- Implement species recovery plans.

4.2.4 Hydrocarbon and Chemical Management

The Environmental Review identified several steps to rectify the current situation including the following:

- Development of a contaminated substances management strategy.
- Conditioning development approvals to ensure appropriate storage.
- Where necessary, enforce the provision of the relevant legislation.
- Identify existing contaminated sites and monitor water quality and health.
- Develop a strategy for the removal of redundant structures.
- Re-fuelling to take place only in designated areas or with appropriate safeguards.

• Develop pollutants policy and implement rehabilitation measures based on Best Practice Guidelines.

4.2.5 Slopegrooming and Construction Activities

The development of an EMS will allow NPWS and other relevant parties to monitor and audit compliance with approval conditions and legislative requirements. Other issues associated with development can be managed more simply by implementing and enforcing appropriate environmental safeguards and management techniques such as the following:

- Develop Soil Management Strategy for all development activities.
- Condition development approvals to incorporate strict soil management guidelines.
- Develop a strategy that identifies responsibility and tasks for rehabilitation of a site.

4.2.6 Waste Management

The Environmental Review identifies the following remedial actions for effective waste management:

- Continued monitoring of watercourses to detect elevated levels in relevant effluent parameters.
- Develop Landfill Management Plans.
- Remove septic tanks in favour of environmentally friendly options.
- Provide accessible waste disposal bins around the resorts area.
- Plan regular litter clean up activities.
- Install Gross Pollutant Traps below resort areas to catch litter/debris.
- Enforce penalties for dumped waste.
- Plan to close and rehabilitate each tip site in the Park within 15 years.

The above remedial actions as outlined in the Environmental Review tend to be generic in their context and not specific to the resorts area. In this respect, the EMS to be prepared by NPWS must outline more specific and suitable measures for remediation of these environmental impacts. The overriding advice of the Scientific Forum in 1997 was that thresholds of acceptable impact may have already been exceeded for some environmental factors. Therefore, it was seen that "minimum impact" would be a more acceptable policy for all future development decisions.

In addition to remedial actions, the Scientific Forum (1997) recommended that future approvals for works and activities in the alpine and sub-alpine areas should, in addition to environmental impact assessment, include a requirement for environmental monitoring, auditing and public reporting of the performance. At the time of approval, monetary bonds should be lodged with NPWS by the proponent to be used for environmental rehabilitation and, if necessary, demolition and removal of structures should the proponent abandon them (Scientific Forum 1997).

4.3 Environmental Management System

The NPWS has commenced preparation of a corporate EMS as a precursor to the preparation of an EMS for the Perisher Range Resorts. In the approval for the Perisher Range Master Plan EIS, there is a requirement that "prior to the construction of any additional beds, an Environmental Management System (EMS) be developed along the general principles of ISO14001".

An EMS will assist the NPWS to clearly define the environmental qualities of the Perisher Range Resorts that need to be protected and to achieve environmental outcomes as required by the NPW Act, the PoM for the Park, the approval for the Master Plan and other environmental legislation.

Elements of the EMS would include the following:

- Policy
- Environmental risk assessment
- Priorities / objectives
- Environmental performance criteria / standards
- Actions / work plans
- Responsibilities (NPWS, Perisher Blue P/L, others)
- Training / awareness
- Auditing / reporting
- Continued improvements

As recommended by the Scientific Forum (1997), the environmental audits set down under the EMS should provide an estimate of the cost (\$) of repair of the more obvious environmental degradation, and also attempt to forecast and cost the more subtle environmental impacts which may not be apparent in the short term. The cost of the rehabilitation program identified by the audits should be used as an indicator of the environmental debt of intensive recreational use of these alpine ecosystems. Other costs (eg loss of natural scenic beauty as an asset for summer tourism) will be more difficult to quantify, but should be recognised. The means of incorporating the cost of repair and compensation for the loss of natural assets of the Park's ecosystems should be built in to future consents, approvals and lease renewals and fee structures. The costs of repair should be borne by the users rather than the general community (Scientific Forum 1997).

4.4 Implications for Ski Resort Development

The main planning implications that arise from consideration of past environmental performance in the resorts area include:

- The standard of environmental protection and management in the resorts area has been less than should be expected by the community and any future development plans must not result in further decline.
- Identified environmental remediation and improvement works should be included in a structured and prioritised program and where appropriate incorporated in new development plans.
- A comprehensive EMS must be prepared by NPWS for the resorts area which will outline goals and strategies for managing environmental risk. All development planning for the resorts must be in accordance with this EMS.
- Planning should assign clear responsibilities for environmental performance to the NPWS, all lessees and other relevant parties.
- Future developments within the resorts area must be able to demonstrate a net environmental benefit. Where appropriate, this may include compensatory measures to mitigate environmental damage.

5.1 Ecological Values of the Ski Resort

The Australian snow country, which includes the alpine area above the treeline and the subalpine zone 300-500m below the treeline, comprises a tiny (0.15%) and unique part of the Australian continent (NPWS 2000). Much of the biota in this area are endemics, having been isolated from the remaining alpine parts of ancient Gondwana for many millions of years. This ecosystem is now restricted to the Kosciuszko Plateau of south-eastern New South Wales and the Bogong High Plains and isolated mountain peaks in Victoria and Tasmania. The Snowy Mountains region is one of the most extensive of these areas (Costin *et al.* 1979).

The ecological features which are found in the Perisher Range Resorts are not widespread in Australia or even within the Park. The resorts have been developed in areas with some very important habitats, the significance of which was not understood at the time of early development of the resorts. The common argument that "the resorts are only a tiny 1% of the Park" and therefore do not have special ecosystem values is not valid. Some aspects of the ecosystems of the resorts area have very restricted occurrence and are unlike most of the Park's other snowfield areas (eg habitat for the Mountain Pygmy-possum).

The resorts area is characterised by a subalpine climate and environment, being located between the treeline at its upper limit and the winter snowline at its lower limit. In the resorts area, the subalpine zone is distinguished by a continuous snow cover for one to four months per year, with minimum temperatures below freezing for about six months of the year (refer Section 5.6). The subalpine zone is also characterised by the presence of woodlands dominated by Snow Gum, wet and dry heathlands and sod tussock grasslands (refer Section 5.4).

Costin (1961, 1979) and others have described in detail the flora of the resorts area and the wider Kosciuszko National Park. The vegetation is described as rich and diverse and compares in beauty and interest with the better-known alpine floras of the Northern Hemisphere. Within the resorts area itself, large areas of bog, fen and Snow Gum woodland can be found and many of these areas have been identified as being of state and national significance (Ecology Australia 2000). Many threatened and significant plant species can also be found within the resorts area, including the endemics *Ranunculus dissectifolius* and *Ranunculus anemoneus*, as well as *Agrostis meionectes* and *Euchiton nitidulus*.

Approximately twenty mammal species have been recorded within the wider Kosciuszko National Park. Many of these species are also common at lower altitudes except for the Mountain Pygmy-possum *Burramys parvus* and the Broad-toothed Rat *Mastacomys fuscus*, which in NSW are restricted to areas above 1000m. The resorts area contains a significant population of the Mountain Pygmy-possum at Blue Cow, while the Broad-toothed Rat has been recorded frequently throughout the Perisher Valley and Smiggin Holes areas (refer Section 5.4).

The area surrounding the main carpark at Perisher Valley supports important bog and fen communities of at least State significance (Ecology Australia 2000). At least one flora species and two fauna species of conservation significance (TSC Act or ROTAP) have been located within the communities to the north and east of the carpark area. The fen community around the north-eastern perimeter of the car park is contiguous with the *Epacris - Richea* Bog Complex extending upslope and covering extensive areas to Pipers Gap, north of Summit Road. The Betts Creek area is similarly considered to support intact bog and fen communities of National significance.

5.2 Landform, Geology and Soils

Perisher Valley and Smiggin Holes are located at an altitude of approximately 1700m. Guthega is slightly lower at 1600m. The resorts area is dominated by the Perisher Range, which separates Perisher Valley from Guthega and the Rams Head Range (which lies to the south-east of Perisher Valley and Smiggin Holes).

The Perisher Creek valley is the major valley in the study area. It is asymmetrical in cross-profile, with the high, steep slopes of Mount Perisher and Back Perisher Mountain on the western and northern sides and the lower peaks Mount Wheatly and the Rams Head Range on the eastern side. Accumulated alluvial sediments flanked by low terraces fill the valley floor and lower slopes. In contrast, Rock Creek and the tributaries of Pretty Valley Creek flow on bedrock. The northern spur of Mount Wheatly separates Perisher Creek valley from Rock Creek valley.

Within the Perisher Range the predominant surface features are boulders and shattered blocks derived from weathering of the Mowambah Granodiorite, a formation of the Kosciuszko Batholith (refer Figure 5.1). In recent times, ski slope grooming, road building and resort development have physically altered the surface terrain in resort areas. Exposed soil is susceptible to increased erosion and removal of boulders and rocks and construction of buildings and structures has altered patterns of snow lie (Kinhill 1997). Several localities display domed outcrops, where curving fracture planes have produced a sheet structure with occasional detached slabs. These have varying degrees of steepness and are best developed on the lower northern slopes of Mount Piper and the southwestern slope of Back Perisher. The strong foliation, and other planar fracture surfaces, result in most outcrops being blocky or lens-shaped boulders.

A study by Mallen *et al.* 1985 identified a number of significant and/or sensitive natural geological features in the Perisher Valley-Smiggin Holes resort areas. The sites selected during this study are of importance in the assessment of glacial / periglacial history of the Kosciuszko area. No features of undisputed glacial origin have been discerned in the resorts area, however, a number of boulder accumulations in valley heads, which have the superficial appearance of glacial moraines, are particularly well represented in the area. In total, nine sites within the resorts area have been identified as having significant and/or sensitive features (refer Figure 5.1), including:

- State Significance
 - Perisher Saddle and Head of Sun Valley (between Mt Perisher and Back Perisher)
- Regional Significance
 - Back Perisher (eastern face of Back Perisher, west of Cooma Hut)
 - Blue Calf Pass South (northern tributary of Pretty Valley, southeast of Blue Calf Pass)
 - Lower Perisher Valley (downstream from "Telemark" lodge to pumping station)
 - Mt Piper East (east facing slope of Mt Piper opposite Smiggin Holes)
 - Mt Wheatly and Rock Creek (summit of Mt Wheatly / southwestern tributary of Rock Creek)
- Local Significance
 - Mt Perisher (summit and northeastern slopes)
 - Mt Piper North (ridge extending northwest from Mt Piper)
 - Mt Piper West (western upper slopes of Mt Piper near the trig point)

Each of the above sensitive geological features has been identified as being of particular importance in tracing the glacial/periglacial history of the Kosciuszko area (Mallen *et al.* 1985). On a wider scale, the following two features have also been described as significant within the alpine area (Good 1992):

 Ordovician marine muds, silts and sands exposed as hard quartzites and softer phyllites and schists; the highest and most prominent are near Rawson Pass. • Exposures of the three forms of granitoid rocks along the Main Range and adjoining slopes and valleys.

Good (1992) reports that "the Australian Alps as part of this ancient landscape, harbour a history of geological and geomorphological processes of world interest". The glacial and periglacial features of the alpine area are unique in the context of mainland Australia but they also amplify the global picture of remarkable events during Quaternary cold events. Both Mallen *et al.* and Good have expressed the need to protect all of these features and mitigate any posed threats. All future planning for the resorts area should take these features into account and provide protection / monitoring as required.

According to Costin (1954), six types of soils are found within the wider resorts area, varying with different hydrological regimes, namely Alpine Humus Soils, New Peat Soils, Valley Bog Peat Soils, Raised Bog Peat Soils, Lithosol Soils and Snowpatch Meadow Soils (poor fen peats). On exposed summits, steep slopes and ridges, where ice frequently forms and strong winds remove finer particles, the shallow lithosols are found. Soil formation in these areas is further inhibited by low temperatures and low soil moisture content. The alpine humus soils (predominant soil type) are rich in organic matter and occur in more sheltered and better drained areas on the lower slopes. The valley bog peats, which are commonly waterlogged and acidic and contain high levels of organic matter, occur in areas where groundwater is high, commonly adjacent to creeks.

Cousins (1998) identified a large area of the Perisher Creek catchment which has a very high potential for erosion. Figure 5.2 shows the distribution of soil types within the Perisher Valley and Blue Cow resort areas, as prepared by Cousins in 1998. Presently, no equivalent mapping occurs for Smiggin Holes or Guthega resort areas.

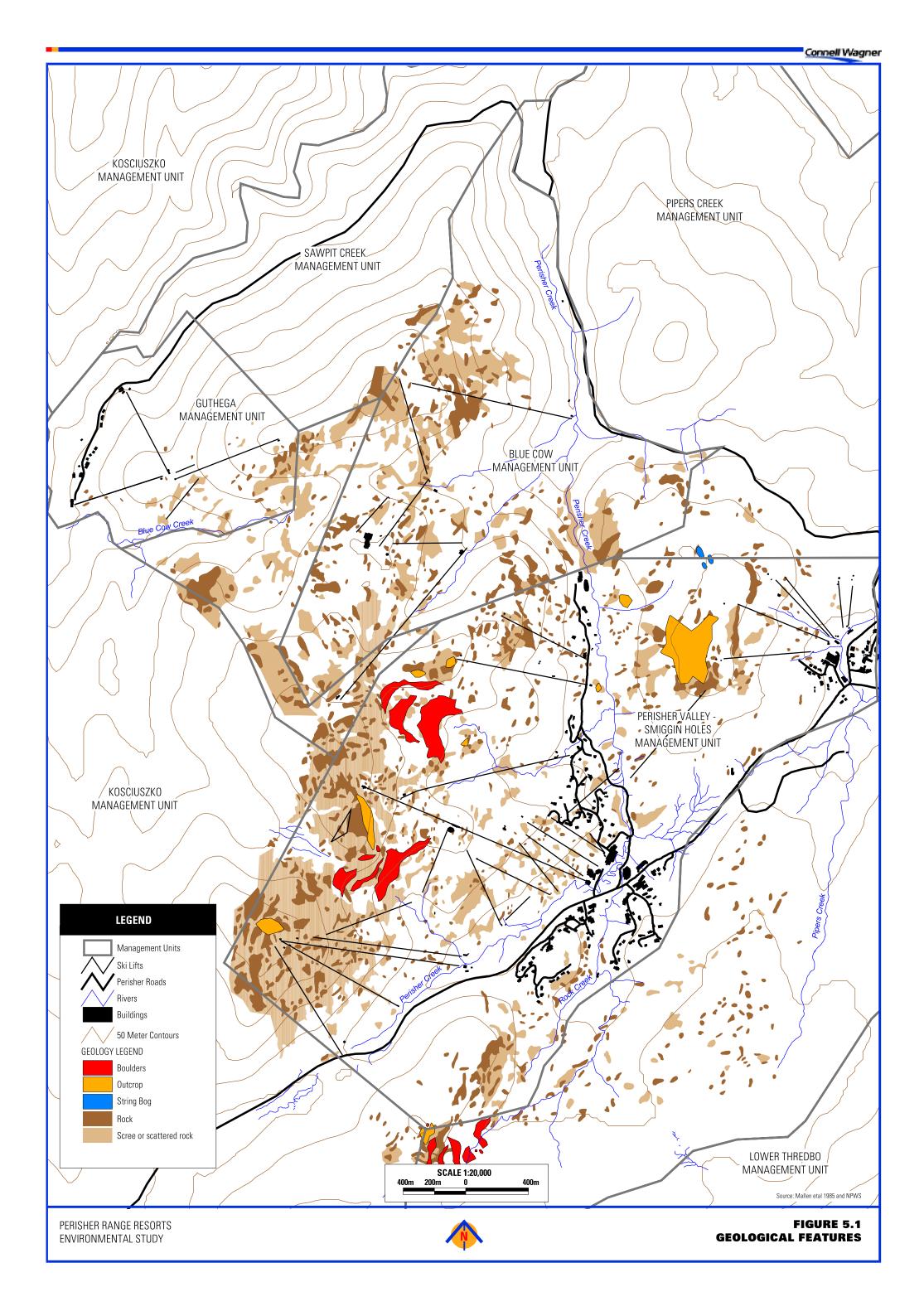
The peats of the valley floor are partially overlain by gravels and sands deposited by tributary streams and derived from mass wasting at the adjacent valley slopes. The subsurface conditions at the Perisher Valley and Smiggin Holes car parks are similar in that they comprise fill material of granitic soils overlaying, in part, water courses. They have been subject to considerable settlement and compaction over time (Kinhill 1997).

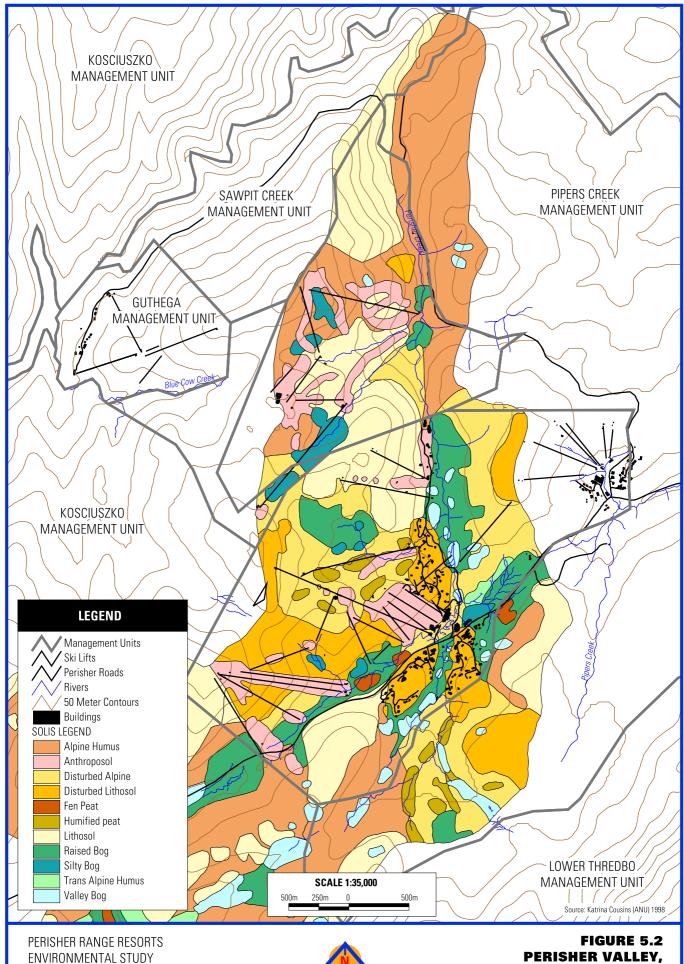
5.3 Water Catchments and Management

5.3.1 Catchments

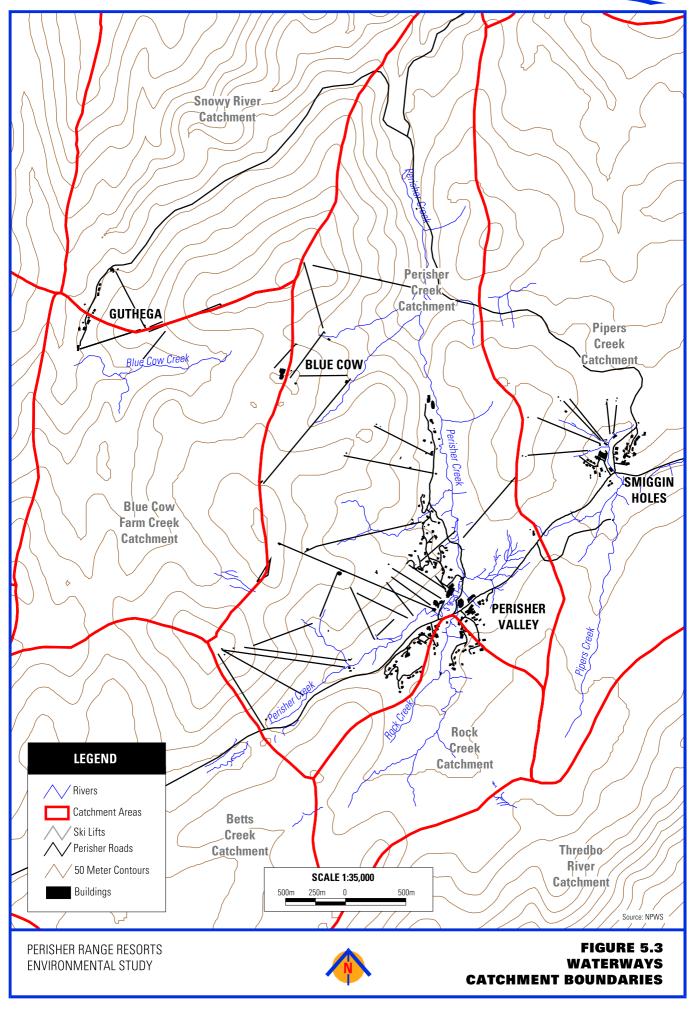
There are five major catchments which drain the Perisher Range Resorts. The largest is the Pipers Creek catchment (2686ha) which drains the eastern section of the resort area, including Smiggin Holes. The Perisher Creek catchment drains the central section of the resorts area including Perisher Valley (1252ha) as far south as the main village area. The Rock Creek catchment is located immediately south of the Perisher village area (286ha). The Blue Cow resort area is drained predominantly by the Blue Cow / Farm Creek catchment (657ha), while the Guthega resort area is drained by both the Blue Cow / Farm Creek catchment and the Snowy River catchment on the southern and northern slopes respectively. Refer Figure 5.3 for a map of the catchment boundaries and areas.

Perisher Creek is a perennial stream which rises at Perisher Gap and flows in a north-easterly direction. Rock Creek rises near Porcupine Rocks and flows north to join Perisher Creek. A number of small channels that rise in the Pipers Gap area also drain into the valley bog where the two major creeks meet. Smiggin Holes is drained by Smiggin Holes Creek which rises on Mount Piper and flows south-east to join Pipers Creek. Pipers Creek flows in a north-easterly direction then into the Pipers Creek Aqueduct to Perisher Creek and then to Guthega Pondage.





PERISHER VALLEY, BLUE COW SOILS



The four main water courses flowing into the Guthega Pondage are Blue Cow and Farm Creeks, Guthega River and the Snowy River. Farm Creek flows in a northerly direction to join Blue Cow Creek, which then drains into the pondage (Kinhill 1997).

5.3.2 Catchment Functioning

The ability to hold water and regulate its discharge to rivers out of the alpine environment and to provide general seepage downslope is an important quality of alpine catchments. This is due to several factors including:

- During winter, much water is held as snow and ice and held back from streams until it thaws in warmer weather and boosts stream flow during early summer.
- At other times of the year, continuous vegetation cover and porous soils are important in absorbing and retaining precipitation. Water collects in droplets on the leaves and stems of alpine vegetation. Low temperatures prevent evaporation and water passes easily into the porous soils.
- The high component of undecomposed plant matter in peats and alpine humus soils enables them to hold water for long periods of time. Peats particularly can absorb large quantities and release them slowly. In this environment, subject to enormous volumes of rain and snow-melt, this process is essential in preventing flooding lower in the river/creek system.
- The bog and fen communities (as found around Perisher and Smiggins Creeks) are of
 particular significance in regulating water flow in the resorts area and the Park as a whole.
 Sphagnum moss, one of the major species in the bog communities, can absorb up to
 seven times its own weight in water. The slow release of water from the moss into the
 creek system after winter contributes to a more uniform stream flow, making water
 available in the dry summer months.

The Scientific Forum (1997) found that Kosciuszko is a special area in Australia with less disturbance of headwater catchments than most other places. Furthermore, the natural ecosystems which exist above the dams and the altered areas outside the Park boundary are dependent on catchment condition for their integrity.

Presently, runoff and discharges from the resorts area has the potential to impact on downstream ecosystems. The Scientific Forum (1997) recommended that the condition of the catchments affected by resort areas be monitored by indicators or measures of catchment condition, and reviewed and incorporated into the proposed EMS. Catchment protection measures are needed for resort areas as elsewhere in the Park, notwithstanding downstream dams.

The PoM contains a number of management objectives for water quality including the maintenance of the waters of the mountain catchments in as natural and unpolluted a state as possible; removing sources of pollution (including turbidity) where possible; ensuring that no disturbance occurs to underground waters; and ensuring that no new diversion of water occurs from one catchment area to another.

5.3.3 Surface Water Quality

Since 1993, the Cooperative Research Centre for Freshwater Ecology has undertaken biological, physical and chemical monitoring of selected streams and creeks within Kosciuszko National Park on a three-monthly basis. Included in this monitoring program are Rock/Perisher, Spencers, Pipers and Sawpit Creeks, all of which flow through the general vicinity of the resorts area (refer Figure 5.3). The majority of this monitoring focuses on the impact of the ski resorts and associated sewage treatment plants on the health of the streams. The impacts of sewage effluent on aquatic ecosystems have been found to cause deoxygenation, loss of invertebrate and algal taxa, numerical domination by tolerant species and nuisance algal growth (Cunningham *et al.* 2000).

Twelve sites are sampled as part of this monitoring program, including four along Perisher Creek within the village area. In addition to the standard biological, physical and chemical sampling, the most recent sampling events undertaken in August and November 1999 (during and following the ski season) also included determination of stream velocity and cross-sectional areas for the calculation of instantaneous discharges. Measurements were also made from this data for calculation of nutrient and total suspended solid loadings.

The results of the most recent sampling events as well as a summary of the data from 1993-98 indicate the following:

- Turbidity was low at all sites during the August and November 1999 sampling and records indicate a trend towards a reduction in turbidity over recent years.
- On the sampling occasions during August and November 1999 dissolved oxygen saturation and pH levels did not indicate an impact on the streams from the resort operations. Conductivity at all sites was also low indicating the resort activities have had no obvious effect.
- During the August 1999 sampling, elevated nutrient levels were recorded at Site 123 (Perisher village). Similarly, during the November 1999 sampling, elevated nutrient levels were recorded at Site 107 (Spencers Creek). Both results suggest an impact from the upstream STPs which receive substantially more input during the winter months.
- Since 1993, sampling results of dissolved oxygen, pH, conductivity and nutrients have indicated a major improvement in the health of streams traversing the resort areas of Perisher Valley, Smiggin Holes and Guthega.
- Biological sampling at Perisher/Rock Creek during both August and November 1999
 recorded lower macroinvertebrate taxa diversity at the sites immediately downstream of the
 village and STP compared with the sites located upstream. Results for Pipers Creek did not
 indicate a difference between the taxa richness for the sites upstream or downstream of the
 Smiggin Holes resort area.

Extensive water quality sampling was also undertaken in the Snowy River Catchment during the 1992-93 financial year (Bowling *et al.* 1993). Samples were analysed for total nitrogen, total phosphorus and turbidity. This study concluded that the water quality of streams in the resort areas is usually good, especially during low flow regimes. However, an increase in total phosphorus was evident in Perisher Creek at Blue Cow and in Spencers Creek downstream of Charlotte Pass village compared with sites upstream of the villages. During high flow events, turbidity and nutrient concentrations of the creeks were high.

Since the monitoring of the creeks in the resorts area began in 1993, the biological measurements, together with the KNP predictive model for biological assessment (recently introduced by Cooperative Research Centre for Freshwater Ecology), have detected impacts resulting from resort operations. Consistent with previous findings, the impacts detected from resort operations are not severe enough at any sites to cause marked depression of invertebrate numbers, however, the impacts detected do show impairment compared to reference conditions. In an effort to control elevated levels of effluent discharged from the STP at Perisher Valley into Perisher Creek, work has begun on a new STP to upgrade both the filtration, aeration and discharge components of the plant.

5.3.4 Groundwater Quality

A groundwater and geotechnical assessment was carried out as part of the Master Plan EIS (SMEC 1998). A further monitoring program was initiated by NPWS and undertaken by SMEC

during the period May 1998 and August 1999. This study involved recording groundwater depth, water temperature, pH and conductivity at monthly intervals over the study period at six locations throughout the Perisher Valley and Smiggin Holes areas.

The flow of groundwater at both Perisher Valley and Smiggin Holes follows the natural topography. At Perisher Valley, the groundwater levels suggest a concentration of flows towards the north-west corner of the car park and from the Rock Creek culvert at Kosciuszko Road towards the Skitube backfill. At Smiggin Holes, the flow of groundwater is much more confined due to the shape of the catchment leading down the valley.

The results of the monitoring program are summarised below:

- The depth of the water table generally varies from 0.43-0.79m during the year at Perisher Valley and from 0.61-1.24m at Smiggin Holes (SMEC 1999). The groundwater is at its highest level in spring, and sometimes winter, and at its lowest level in summer and autumn.
- The mean monthly groundwater temperatures reach a maximum of 16.9°C in January, reducing to 12.3°C in May and then falling to a range of 6.2°C to 9.6°C for July to November.
- Groundwater conductivity values are low at both Perisher Valley and Smiggin Holes over most of the year, with slight increases in late autumn to spring.
- The mean groundwater pH recordings show approximately neutral values from September to February then acid values (to pH 5.1) from March to August. The acidic conditions are attributable to carbonic acid in rain and to peaty soil acids.
- No combustible gas was found at any time in the drill holes in the Perisher car park, nor
 was any gas found at the inlets or outlets of the creek diversion outlet under the car park.
 Combustible gases were recorded in small levels near the Perisher Blue Workshop at
 Smiggin Holes and at higher levels in the hole drilled at the Smiggin Holes main car park
 during the early part of the monitoring program, however, none have been recorded since
 October 1998.

In general, the spring to late summer period begins with high groundwater levels from snow melt, low groundwater temperatures, falling conductivity and typically neutral pH conditions. As the temperature rises to mid summer the groundwater levels fall, the average conductivity continues the fall gradually and the average pH remains neutral. The groundwater acidity increases around March at a time when most groundwater levels are near minimum (SMEC 1999).

5.4 Flora and Fauna

5.4.1 Vegetation Communities

Australian alpine and sub-alpine vegetation is highly distinctive, is restricted within Australia and has a relatively high degree of endemism (Costin *et al.* 1980). The Perisher Range Resorts form part of a sub-alpine complex that is considered both nationally and internationally significant. The Alpine flora has not suffered the same level of depletion as its montane and lowland counterparts, although degradation through grazing and weed invasion remain important issues. Throughout the alpine region there is considerable evidence that some communities are far more restricted than others or are keystones in ecosystem dynamics. In NSW, these include fens and bogs, boulderfield communities, short alpine herbfield, feldmark and snowpatch vegetation (Costin *et al.* 1980, Mallen *et al.* 1985). These more restricted vegetation types are considered to be Nationally significant (refer Table 5.1).

The subalpine vegetation includes Snow Gum woodland with a grass or shrub understorey, and heath, grassland, fen and bog vegetation where environmental conditions preclude tree growth. Within each structural vegetation type, different communities develop in response to changes in microclimate, soil type, aspect and slope. The major plant communities found within the Perisher Range Resorts are listed below and described in detail in Costin (1961, 1979) and Kinhill (1997):

- Snow Gum Woodland
- Wet Heath
- Transitional Heath
- Dry Heath
- Grasslands
- Bog
- Fen
- Rocky Snow Patches
- Short Alpine Herbfield

It is noted that 'Old-aged Mature Snow Gums' (generally found within the Snow Gum Woodland Community) are listed on the Draft Kosciuszko National Park Schedule of Significant Natural Features. The Snow Gums are classified as a Category 1 which is defined as "very highly significant by virtue of status, condition, distribution, context eg. declining, critically endangered, very restricted, vulnerable to change and age". All items listed under Category 1 must be fully protected against disturbance or failure to conserve.

All other old-aged mature vegetation communities or isolates are listed under Category 2 of the Schedule which is defined as "highly significant by virtue of distribution, status or conditions. Significant for scientific or cultural values, vulnerable to disturbance".

Sphagnum bogs and fens are important components of the Alpine Complex. The bog and fen communities within resorts area represent areas of vegetation which, in most cases, have been assessed as being of State or National significance (Ecology Australia 2000). These communities offer a favoured breeding site for many of the threatened fauna species found in the area including the Corroboree Frog, Alpine Tree Frog, Alpine Water Skink, Latham's Snipe and Broad-toothed Rat. The bog and fen communities also support many of the threatened flora or ROTAP species including *Ranunculus dissectifolius* and *Agrostis meionectes*. Bog and fen vegetation is particularly important for the maintenance of catchment efficiency.

The significance of the various vegetation communities was assessed by Ecology Australia during their study of the resorts area. A summary of the findings is given in Table 5.1.

Vegetation Community	Relative Distribution in NSW Alps	Significance
Upland Bog	Restricted	National
Valley Bog Complex (including Fen)	Restricted-Very Restricted	National
Block-Stream Heath	Restricted	National
Rocky Snowpatch Herbfield	Restricted	National
Short Alpine Herbfield	Very Restricted	National
Sod Tussock Grassland (upland)	Restricted	State
Tall Alpine Herbfield	Restricted	State
Rocky Outcrop Heath	Common	State
Short Alpine Heathland	Restricted	State
Tall Alpine Heathland	Common	State
Upper Sub-Alpine Woodland	Common	Regional
Sub-Alpine Woodland	Abundant	Regional

Table 5.1 Significance of Vegetation Communities (Source: Ecology Australia 2000)

Maps showing the distribution of the above vegetation communities have been prepared by David Hogg (1997) and Ecology Australia (2000). A copy of the mapping undertaken by Ecology Australia is included as Figure 5.4(a-b). Figure 5.5 is a map of the wetlands contained within the resorts area, produced through an amalgamation of the wet heath, transitional heath, bog, wet grassland and fen communities (as mapped by Ecology Australia 2000, based on Hogg 1997).

5.4.2 Threatened or Significant Flora Species

Several TSC Act scheduled plant species and ROTAP (Rare or Threatened Australian Plants) species have been recorded within the Park and in particular within the resorts area. During studies undertaken for the Master Plan EIS (Ecology Australia 1997), two ROTAP species were located within the resorts area: *Ranunculus dissectifolius* and *Agrostis meionectes*. No TSC Act scheduled plants were recorded during this survey, however, more recent surveys in 1999/2000 (also by Ecology Australia) revealed the presence of two threatened species (TSC Act and/or ESP Act), including:

- *Ranunculus anemoneus* (TSC Act & ESP Act) found in Rocky Outcrop heath at Blue Cow
- Euchiton nitidulus (ESP Act) found in Snowpatch north of Pleasant Valley Quad Chair

A total of 10 ROTAP species were identified by Ecology Australia (2000) in the resorts area. These species are listed below together with the habitat preference of each. The location of these species is mapped on Figure 5.6.

- Brachycome stolonifera (short alpine herbfield)
- Chionchloa frigida (rocky outcrops and on fringes of watercourses)
- *Ranunculus dissectifolius* (wet heath and bog)
- Erigeron setosus (short alpine herbfield)
- Euphrasia alsa (windswept heath along Back Perisher ridge)
- *Carex cephalotes* (alpine herbfield)
- Deyeuxia affinis (short alpine herbfield)

- *Gingidia algens* (subalpine herbfield, wet heath and swampy margins of creeks)
- Oschatzia cuneifolia (bog, wet heath and short alpine herbfield)
- Oreomyrrhis brevipes (rocky sites and boulders in alpine herbfield)

Other ROTAP species which have been previously found in the resorts area (sourced from NPWS Atlas), but were not found in the current surveys are listed below together with their habitat preference:

- Derwentia nivea (grassland, heath, bogs and subalpine woodland)
- Eriochilus cucullatus (heath to sclerophyll forest from sea level to subalpine)
- Westringia lucida (snowgum woodland or alpine heath in rocky areas)
- Astelia psychrocharis (bog, wet heath and wet grassland)

It is noted that all species listed on Schedule 1 of the TSC Act are classified under Category 1 of the KNP Schedule of Significant Natural Features. The NPWS Wildlife Atlas records for both ROTAP and TSC Act scheduled plant species are included on Figure 5.6.

5.4.3 Faunal Associations

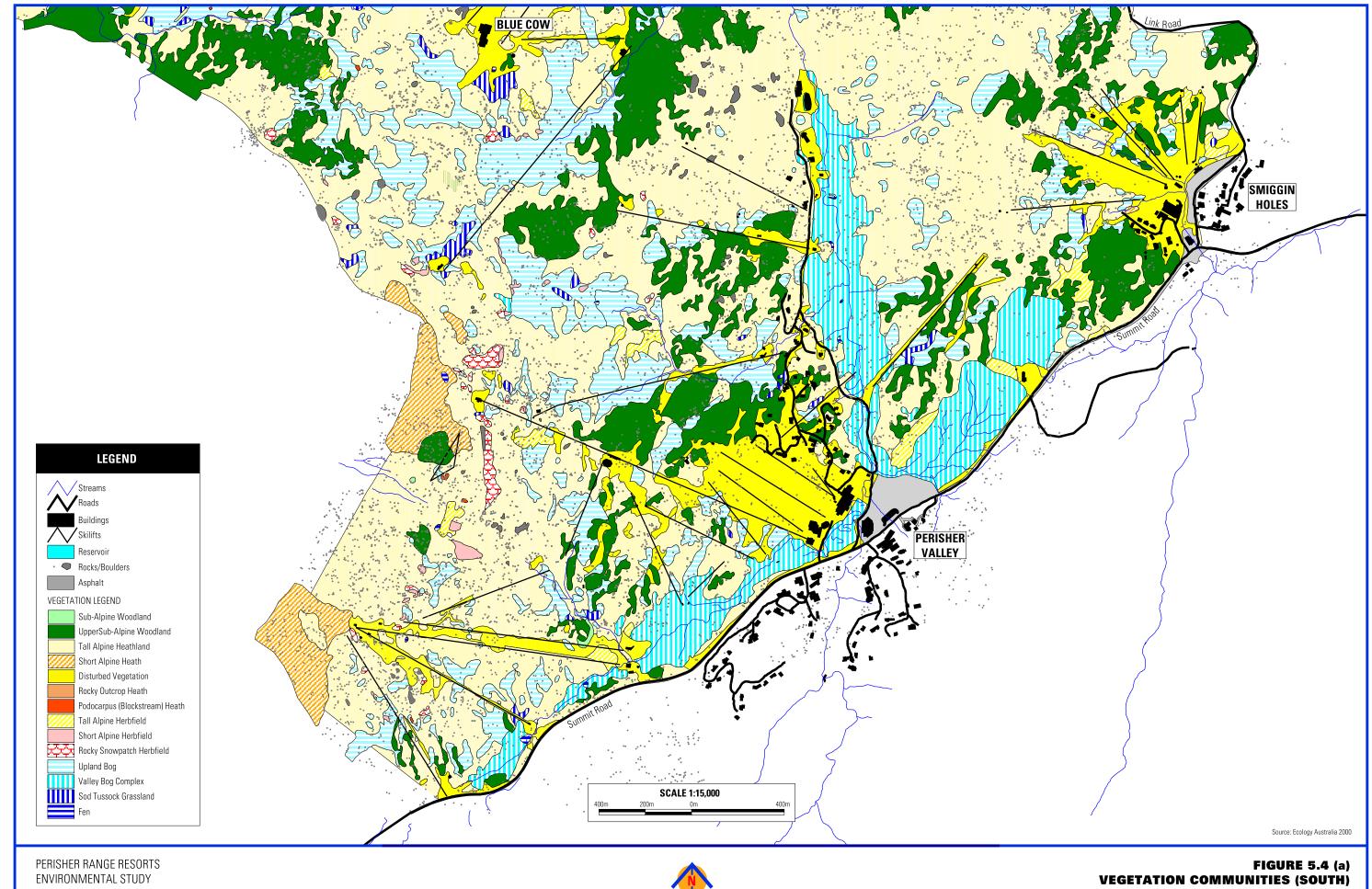
In general terms, the diversity of mammals in the Australian Alps is greatest in the forest and woodlands of the mountain slopes. This includes the large browsing and grazing marsupials such as the Common Wombat, the Red-necked Wallaby, the Swamp Wallaby and the Eastern Grey Kangaroo. Tree dwelling marsupials include possums such as the Common Brushtail, Ringtail, the Eastern Pygmy-possum and a range of gliding possums. Bats are also common in the high country including Goulds Wattled Bat, the Lesser Long-eared Bat and the Chocolate Wattled Bat.

Only one mammal, the Mountain Pygmy-possum, is restricted to the alpine and subalpine zone. This small resilient creature lives in a particular alpine community (refer Section 5.4.4 below) with three other small mammals, namely the Bush Rat, the Broad-toothed Rat and Swainsons Antechinus. In NSW, the Broad-toothed Rat is also confined to elevations above 1000m, however, this species can also be found close to sea level in Victoria and Tasmania (Green and Osborne 1994).

The Australian Alps do not have a distinctive alpine avifauna, probably because of the limited extent of the mountains, however, many of the typical birds of lowland grasslands and forests are commonly observed in the high alps during the summer. Most of the 36 species of birds previously recorded in the resorts area are relatively common and widely distributed (Mallen *et al.* 1985).

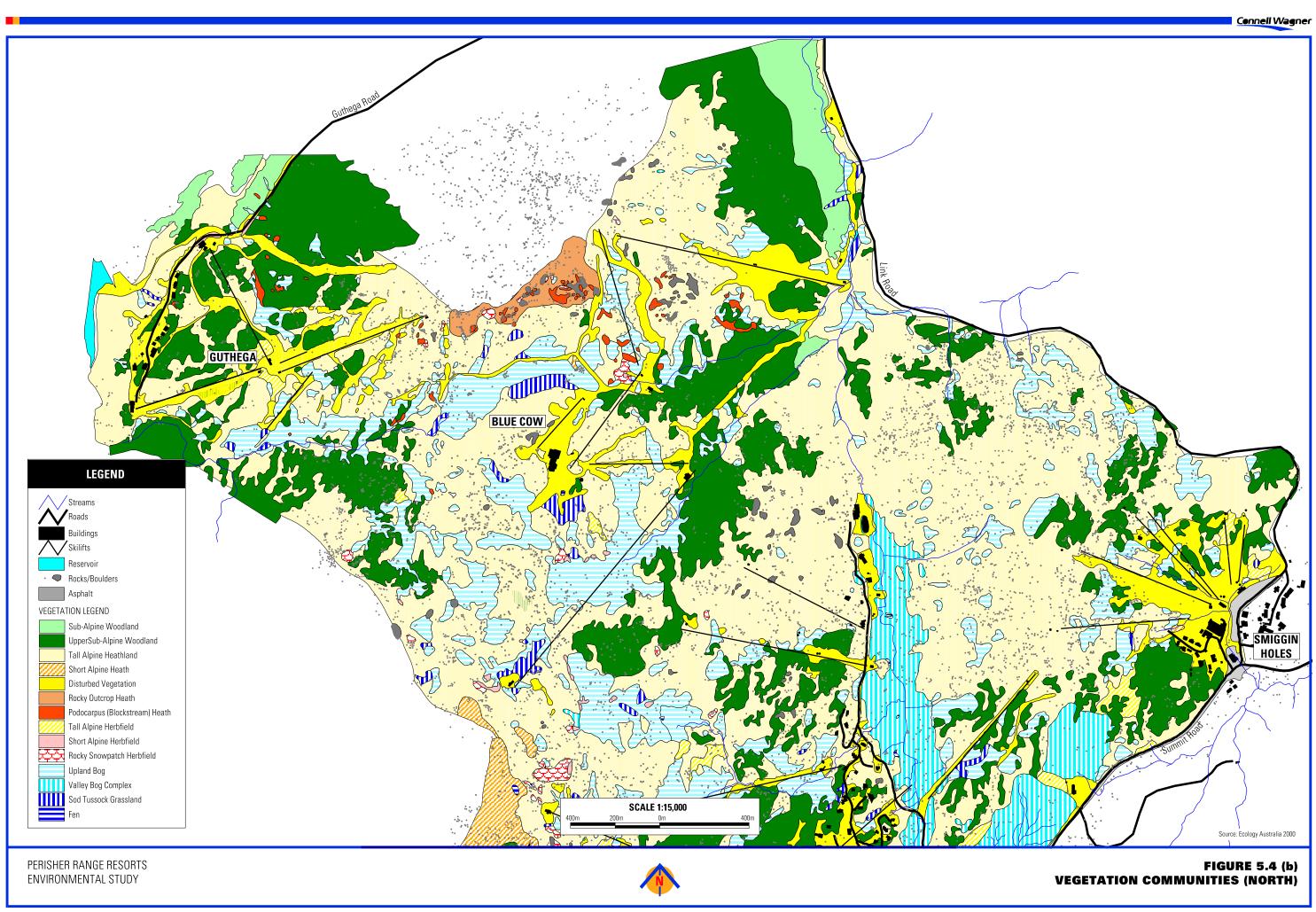
Three main factors influence the distribution of reptiles in the Alps: temperature, availability of sunshine and basking sites, and presence of suitable protection from low temperatures in winter. Common reptiles found through the high country include the Tree Dragon, Grass Skink, Water Skink, Southern Blue Tongue and the Copperhead Snake. Two species are found particularly at high altitudes, namely the Alpine Water Skink (found in Sphagnum bogs) and the She-oak Skink (recorded in subalpine woodland). Refer to Section 5.4.4 below for further information on these species.

One native fish, Mountain Galaxis *Galaxias olidus*, and two introduced species, Brown Trout *Salmo trutta* and Rainbow Trout *Salmo gairdnerii*, are found in the streams of the resorts area. Trout are very common in Perisher and Pipers Creeks, which are popular for fishing. Mountain Galaxias are very uncommon or absent from streams which contain trout, but occur commonly

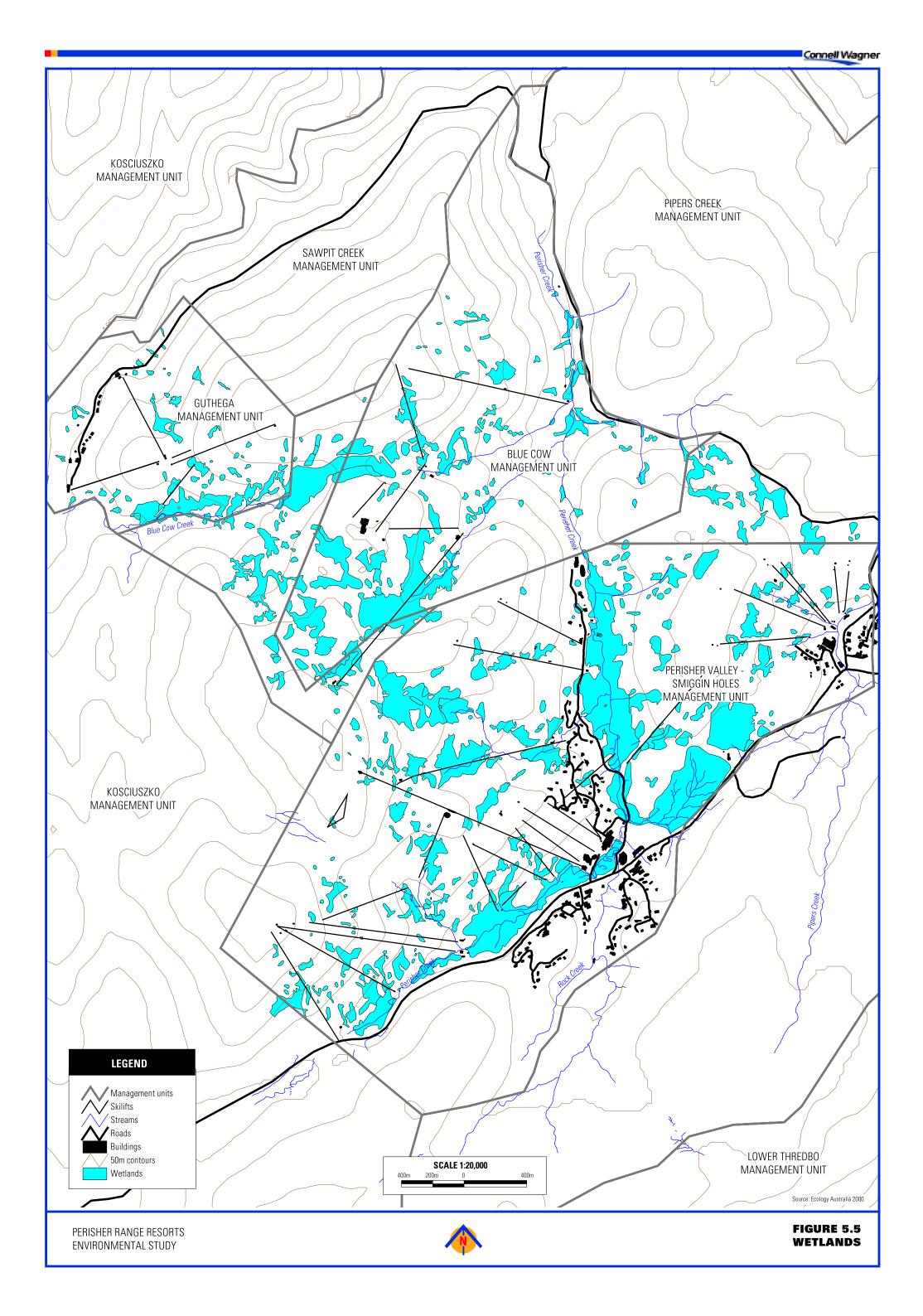


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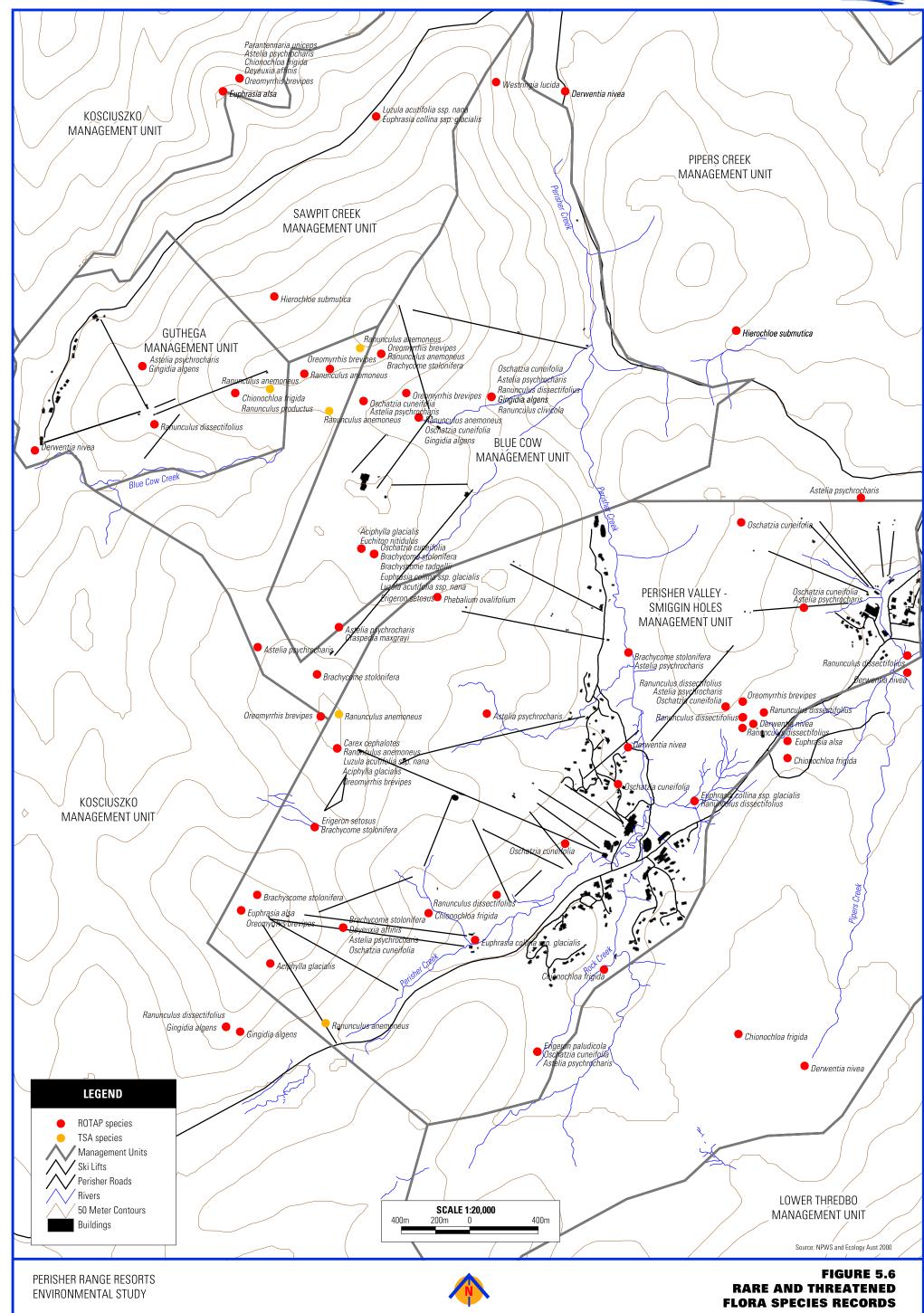








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in Pretty Valley Creek and several other small streams which do not contain trout (Mallen *et al.* 1985).

Fauna species recorded during the 1997 survey of the Perisher Valley and Smiggin Holes resort areas (Nicholas Graham-Higgs) included Brown Antechinus *Antechinus stuartii*, Dusky Antechinus *Antechinus swainsonii*, Bush Rat *Rattus fuscipes*, Broad-toothed Rat *Mastacomys fuscus*, as well as one species of frog, seven species of reptiles and 22 species of birds.

5.4.4 Threatened or Significant Fauna Species

Several threatened or significant fauna species have been recorded within both the wider National Park and the Perisher Range Resorts. The fauna survey undertaken in 1997 by Nicholas Graham-Higgs and Associates for the Master Plan EIS (Perisher Valley-Smiggin Holes only) identified the presence of one TSC Act scheduled species (Broad-toothed Rat) and two other species identified listed in the KNP Schedule of Significant Natural Features (Latham's (Japanese) Snipe and Alpine Water Skink). Additionally, the NPWS Wildlife Atlas Database has records within the resorts area for the Southern Corroboree Frog, the Olive Whistler and the Mountain Pygmy-possum. Habitat mapping for several of the threatened fauna species has been prepared with assistance from NPWS and the University of Canberra and is shown in Figure 5.7 (a-e).

Broad-toothed Rat (Schedule 2 TSC Act)

Many records for this species exist within the resorts area, including records from Perisher Valley, Smiggin Holes, Guthega and Blue Cow. Holloway and Osborne (1997) recorded a very broad distribution throughout the resorts area. During surveys in 1997 by Nicholas Graham-Higgs and Associates, this species was recorded at the base of the Perisher Express Quad, near Perisher Pump Station No. 2 and also at the north-eastern end of the Perisher Carpark. The habitat of this species generally comprises wet heath, snow gum woodland and boulder field areas. An important movement route for this species is considered to occur within the Perisher and Rock Creek corridors.

Latham's Japanese Snipe (KNP Schedule of Significant Features; JAMBA / CAMBA)

The preferred breeding habitat of this species is dry heaths, moors, coastal plains and alpine tussock. Their favoured habitat during non-breeding seasons is subalpine fens, bogs and wet grasslands where they probe for aquatic invertebrate and seed (Green and Osborne 1994). During the surveys in 1997, all of the observations of this species were in fen communities with the areas of known and predicted habitat including north-east of the main Perisher Valley carpark and along Perisher Creek.

Alpine Water Skink (KNP Schedule of Significant Features)

This species has a very specific habitat, being restricted to wet heath and bog areas (Green and Osborne 1994). The 1997 survey of the resorts area found that habitat for this species within the resorts area is relatively widespread and of good condition.

Southern Corroboree Frog (Schedule 1 TSC Act & Schedule 1 EPBC Act)

This endemic species occurs from Smiggin Holes, north to the Maragle Range near Cabramura. The breeding habitat is usually temporary pools and seepages found within bog and wet heath habitats. Habitat present within the resorts area includes bog and wet-heath. During non-breeding periods, this species inhabits adjacent woodlands and dry heathlands which are also present in the resorts area. Despite targeted searches for this species over the past years and the presence of suitable habitat, the Southern Corroboree Frog appears to have disappeared from the resorts area. A Recovery Plan has been prepared by NPWS for this species which states that fire, vehicle use and other disturbances which intercept and reduce water flow into breeding sites can effect the breeding habitat, and should be avoided.

Alpine Tree Frog (Regionally Significant)

In the subalpine zone, this species has been observed breeding in bog pools, wet grassland, fens, stream side pools and artificial lakes and dams. The use of non-breeding habitat for this species is poorly known and understood. Historical records for this species indicate that it was once distributed throughout much of the subalpine and alpine zone of the Snowy Mountains between Dead Horse Gap in the south and Kiandra in the north, in particular several historical records exist for the Smiggin Holes franchise area. Recent surveys for this species in the Park have failed to locate persistent populations in the resorts area. The nearest extant populations included a small number of individuals found breeding in natural bog pools at Charlottes Pass and near Towonga Lodge on the Snowy River. Larger populations have also been located breeding in a series of natural stream side pools at Thredbo and the artificial dam on Diggers Creek at Sponars Inn.

Olive Whistler (Schedule 2 TSC Act)

This species favours dense closed habitats and whilst it was not recorded during the 1997 survey of the study area, potential habitat is located in the woodland, dominated by tall dry heath that surrounds the Smiggin Holes Workshop site. This species has been previously recorded within the resorts area at Smiggin Holes in the area to the south-west of the village centre.

Mountain Pygmy-possum (Schedule 2 TSC Act & Sch 1 ESP Act)

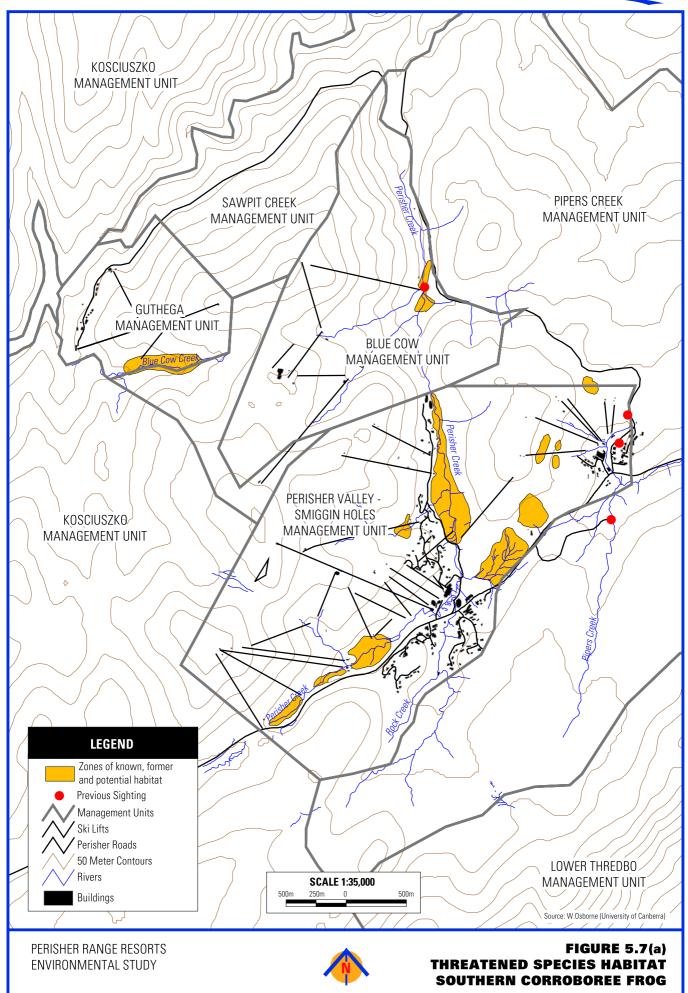
A significant population of the Mountain Pygmy-possum is located in the boulderfields at Mt Blue Cow. In this area, the species is restricted to relatively deep, alpine boulderfields with associated *Podocarpus lawrenceii* heathland vegetation. The total area of suitable habitat in the Snowy Mountains is estimated at 8km² (NPWS 2000). The vegetation component of the habitat of the Mountain Pygmy-possum is extremely sensitive to fire and absolute protection from fire is required. Two "possum-crossings" or artificial boulderstreams, consisting of trenches filled to surface level with boulders have been constructed across the Stampede ski run at Mt Blue Cow and around the bottom station of the "The Summit" ski life. The purpose of these crossings is to allow the very extensive nightly and seasonal movements of this species through the area to continue. A Recovery Plan has been prepared for this species by NPWS.

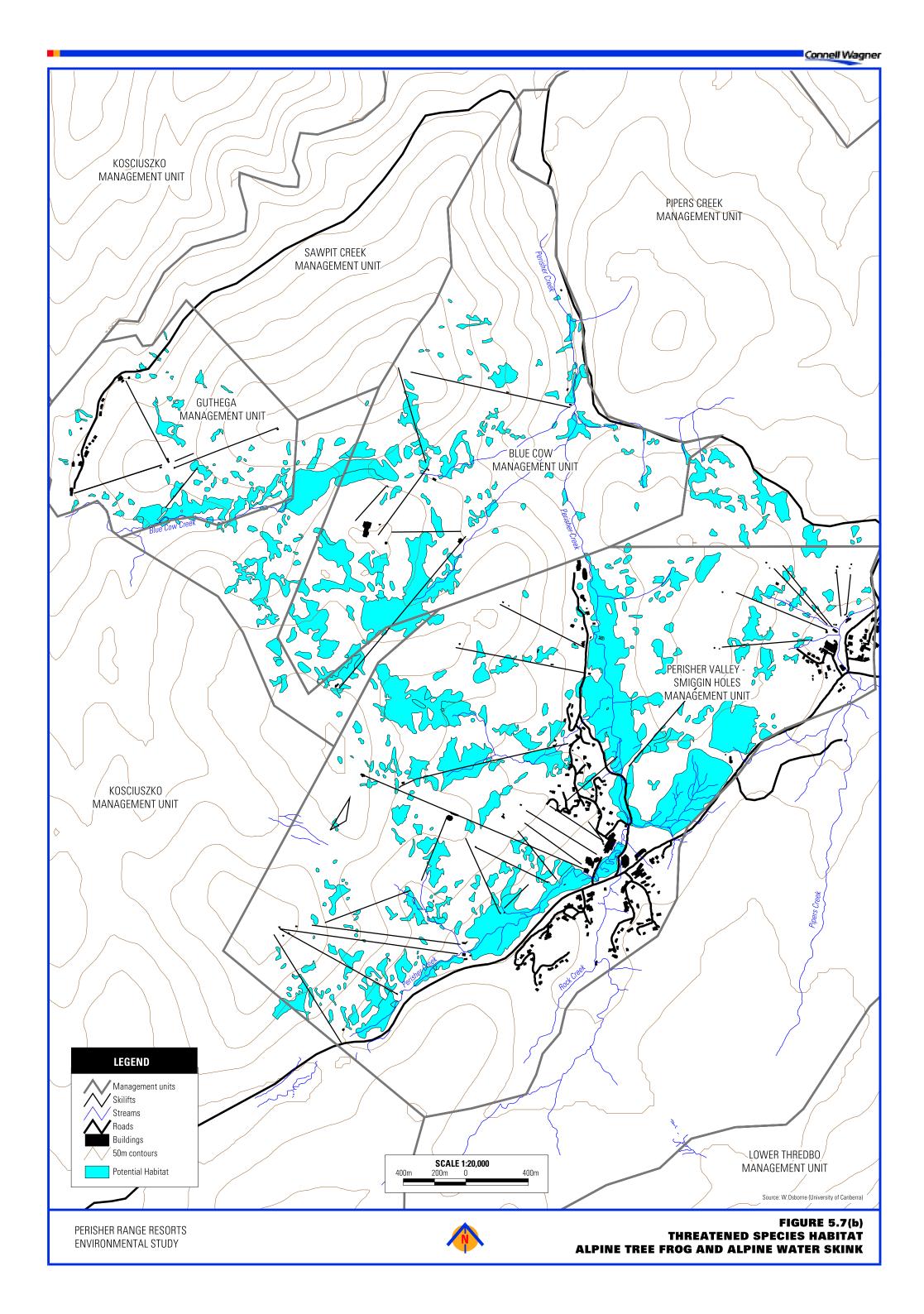
Mountain Galaxias (KNP Schedule of Significant Features)

The mountain galaxias are found from sea level to alpine areas although, due to their predation by introduced trout, are generally restricted to the small headwaters of creeks and areas that cannot be accessed by trout due to obstacles. During the 1997 survey of the study area, this species was recorded in the upper reaches of both Perisher and Smiggins Creeks.

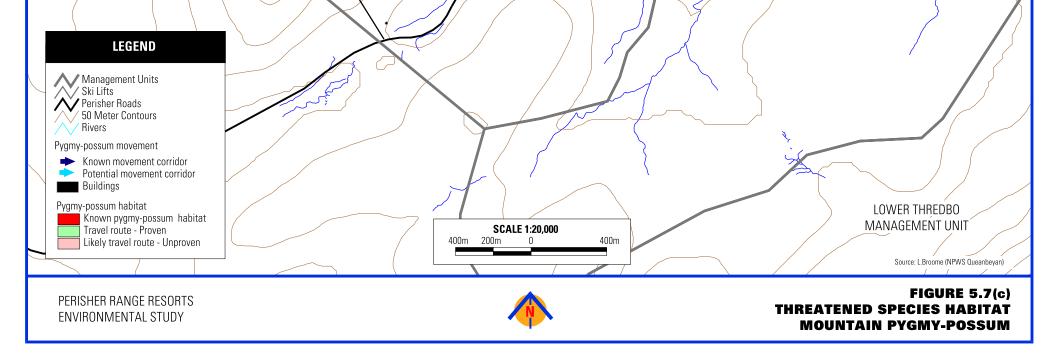
5.4.5 Areas of Sensitive Habitat

Sensitive habitat within the resorts area includes the creek and drainage lines where the bog and fen communities dominate. These vegetation communities are important not only for efficient catchment functioning through filtration of pollutants but also for the habitat they provide for many of the threatened and significant flora and fauna species. Large areas of these communities are present within the Perisher Valley and Smiggin Holes resort areas, particularly around the perimeter of the main car parks. In particular, several threatened fauna and flora species have been identified (Nicholas Graham-Higgs 1997; Ecology Australia 2000) in the bog and fen communities present along the northern and eastern perimeters of the Perisher Valley car park. Sensitive habitat is also located within the boulderfields or Podocarpus habitat in the Blue Cow resort area. These areas are known to support a significant population of the Mountain Pygmy-possum

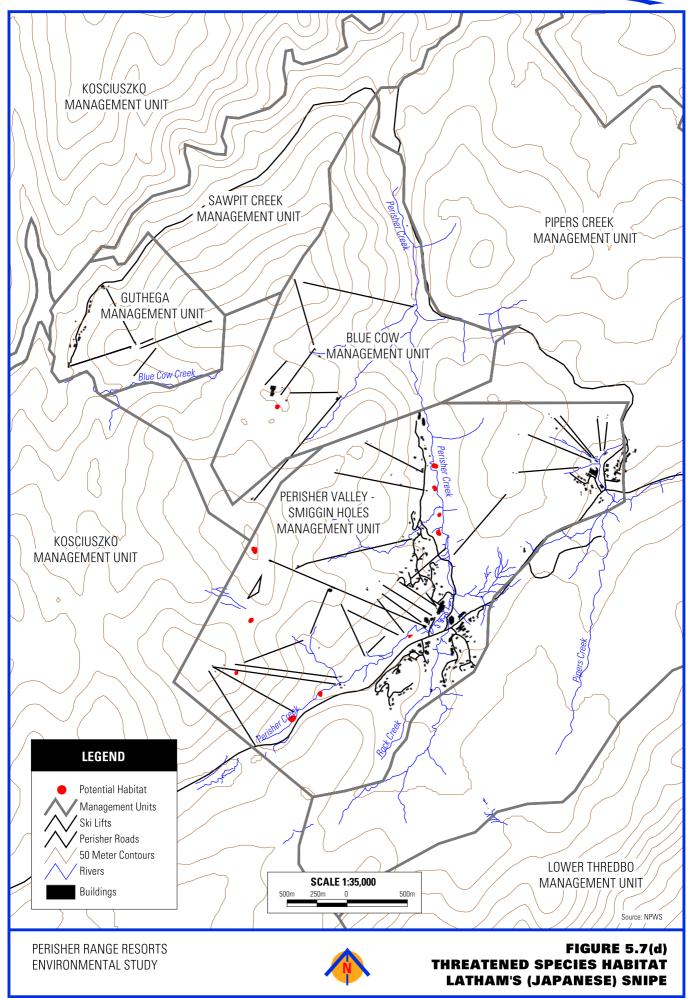


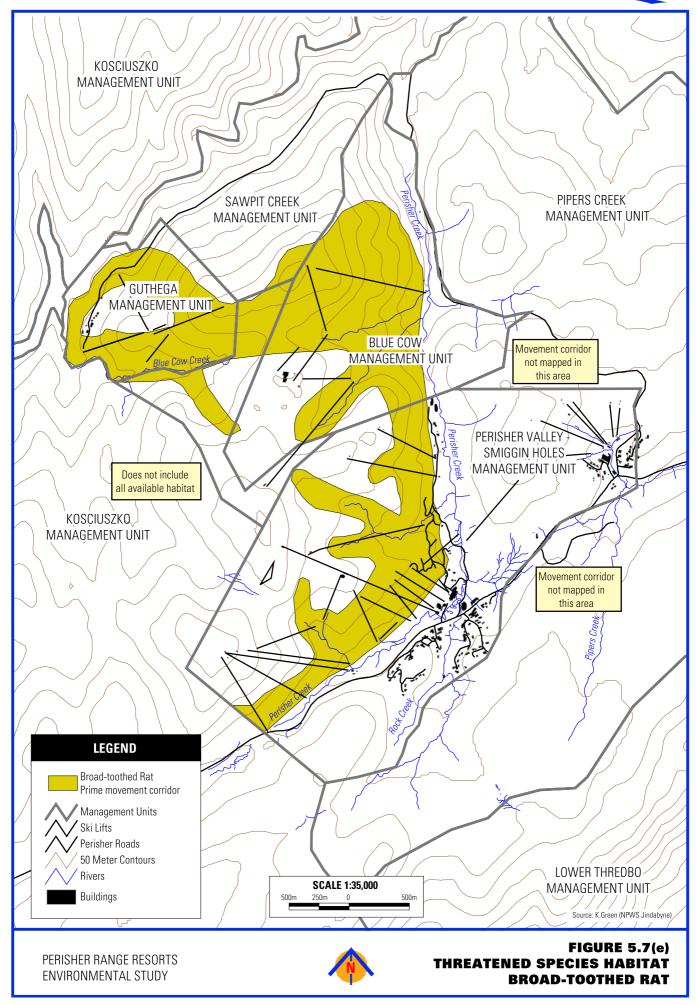


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5.5 Natural Hazards

5.5.1 Flooding

The resorts area is drained by a number of creeks flowing in a northerly or north-westerly direction, including Perisher Creek, Rock Creek, Pipers Creek, Old Farm Creek, New Farm Creek, Blue Cow Creek and Smiggins Creek. Of these, the flooding characteristics of only Perisher and Rock Creeks have been studied in detail (SMEC 1997). This study analysed the flood patterns and levels of the creeks for the 20, 50 and 100 year flood events.

Perisher Valley is drained by Perisher Creek, Rock Creek and their smaller tributaries. Perisher Creek is a perennial stream that rises at Perisher Gap and flows in a north-easterly direction, meandering in a number of large loops through a valley bog between the village and the ski lifts. The Creek is known to flood in this area, particularly with snow melt in the spring. The lowest flows are from January to April when precipitation is low and flow is principally maintained by springs, bogs and groundwater flow (Kinhill 1997). This creek system has been altered since the 1970s, with considerable changes in flow paths, cross-sectional profiles and water quality.

The flood study of Perisher/Rock Creeks detailed the extent to which water levels would be expected to rise for the 100 year ARI flood at locations of interest along the Creek. This information is presented in Table 5.2 and shown on Figure 5.8.

Location	Flooding Characteristics	
Concrete Car Park Bridge	0.51m above bridge deck (no snow case)	
	0.99m above bridge deck (snow encroachment)	
Sewage Pumping Station No. 2	0.45m above floor level (no snow case)	
	0.64m above floor level (snow encroachment)	
Perisher Centre Pedestrian Bridge	No overtop (no snow case)	
	0.05m above bridge deck (snow encroachment)	
Perisher Centre	No overtop (no snow case)	
	0.02m above floor level (snow encroachment)	
Ski Tube Pedestrian Bridge	No overtop (no snow case)	
	No overtop (snow encroachment)	
Quad Chair Oversnow Bridge	0.15m above bridge deck (no snow case)	
	0.37m above bridge deck (snow encroachment)	
Quad Chair Road Bridge	No overtop (no snow case)	
	No overtop (snow encroachment)	
Oversnow Bridge near Kosciuszko Road	0.44m above bridge deck (no snow case)	
	0.85m above bridge deck (snow encroachment)	
Culvert Beneath Kosciuszko Road	0.23m above culvert soffit (no snow case)	
	0.70m above culvert soffit (snow encroachment)	
Ski Tube Building	0.26m above floor level (no snow case)	
	0.68m (snow encroachment)	

Table 5.2 100 Year Flood Levels in Perisher Creek

5.5.2 Geotechnical Instability Hazards

A study of the geotechnical hazards within the resorts area was completed by GHD-Longmac (2000). An outcome of the study was the preparation of Geotechnical Policy A4 Maps (Figure 5.9) which have been compiled specifically for the Kosciuszko National Park Environmental Planning and Assessment Manual Policy A4. The maps delineate areas that have been designated "G", within which a Geotechnical Report is required in accordance with Policy A4 to accompany an activity or development application.

Area "G" boundaries have been determined from the results of geotechnical field mapping carried out in May 2000. The purpose of the mapping was to identify areas where geotechnical instability hazards either exist, or could be created by inappropriate development activities. Such areas fall within the "G" line on Figure 5.9. Geotechnical instability hazards can comprise uncontrolled or unretained fill, slope instability (landslides), cutting/excavation instability or boulders/rockfalls, and multiple hazards can occur.

It is noted that future modifications to site conditions and refinements to available data, including base maps, may result in "G" area boundary location amendments from time to time.

5.5.3 Bushfire

A Fire Management Plan was prepared by NPWS for the Park in early 2000. The objectives for fire management in the Park are twofold, namely to protect human life and property within the Park, and to conserve the natural and cultural features, catchment values and recreational opportunities within the Park. The NPWS is responsible for bushfire suppression within the resorts area, while the NSW Fire Brigade has the responsibility for fire suppression within buildings.

Perisher Valley, Smiggin Holes, Guthega and other village lodges are in a low bushfire risk category in average years (NPWS 2000). In extreme fire events, all ski resort property, infrastructure and other assets may be under threat and require village protection plans, Community Fire Guard programs and adequate property protection systems (eg sprinklers in building design).

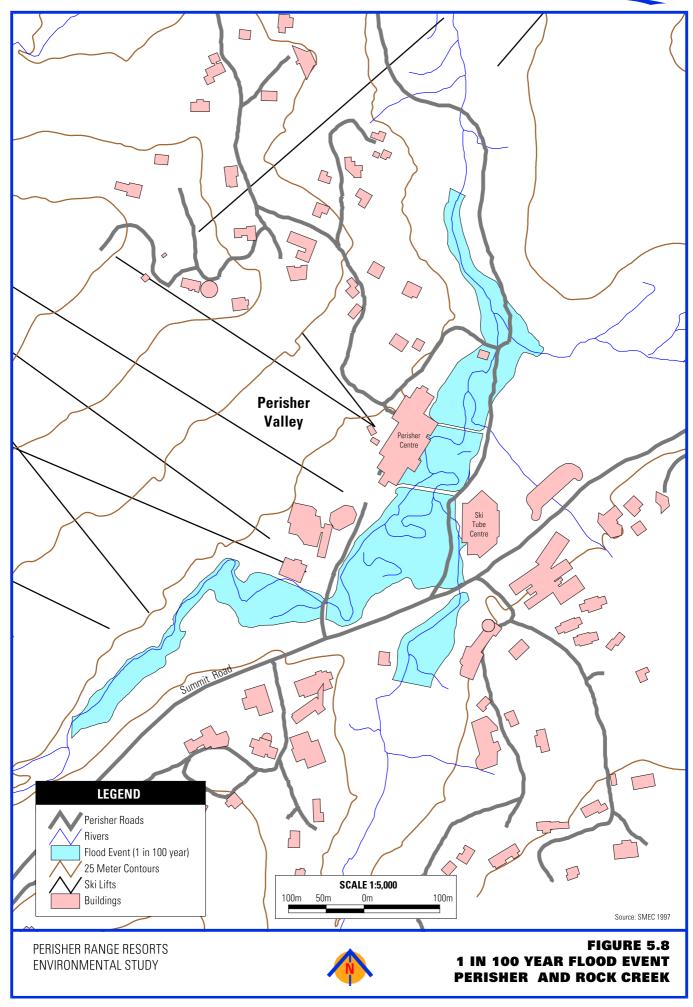
Since 1956, only two fires have been recorded in the vicinity of the resorts area, one caused by negligence/accident (Guthega) and the other of unknown origin (Smiggin Holes).

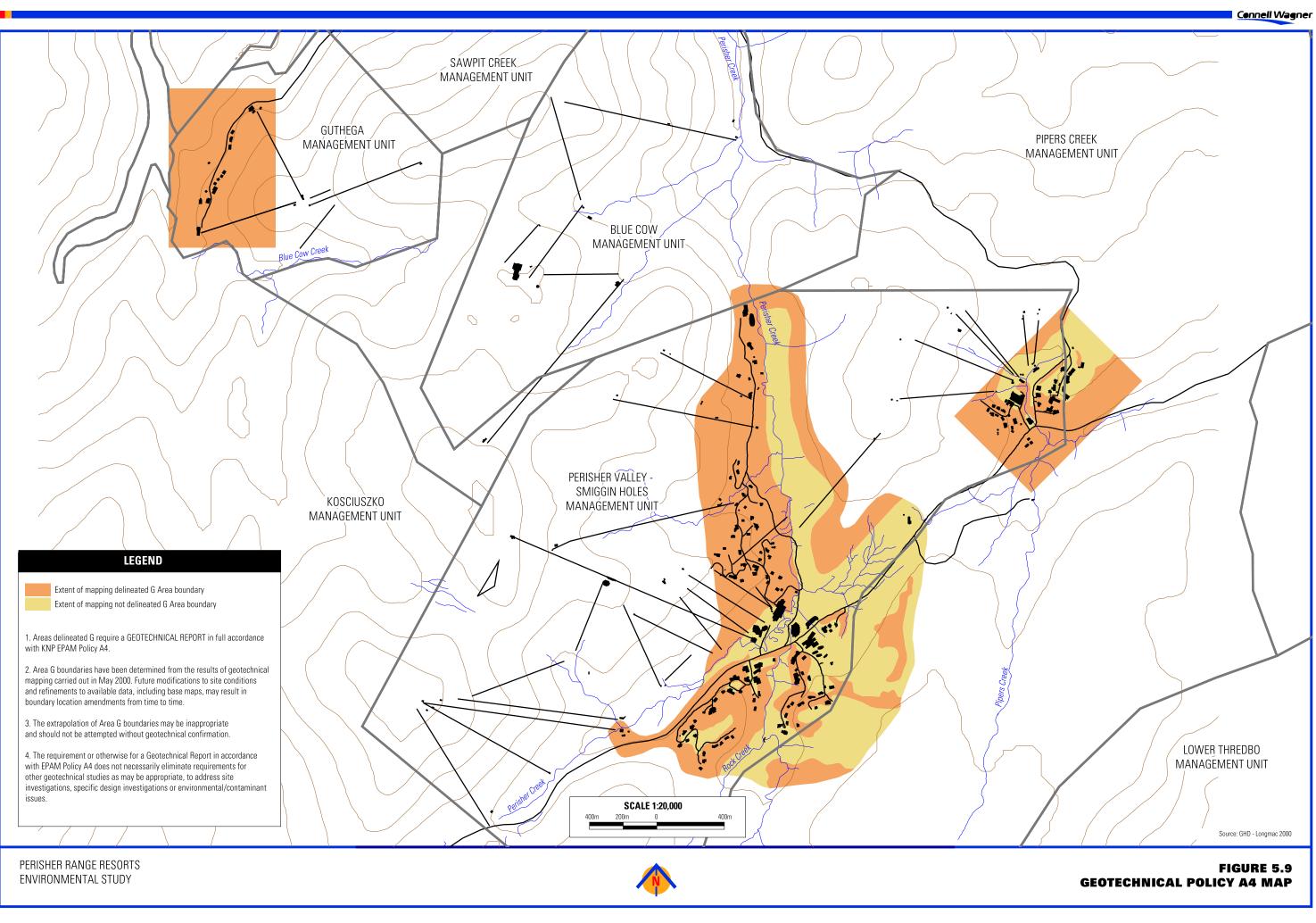
5.6 Climatic Characteristics

5.6.1 Temperature

A number of factors determine the temperatures at a given site and these include heat balance and advection which vary with latitude, elevation, distance from the coast, aspect and exposure. In Australia, the alpine climate is essentially maritime in that seasonable extremes are somewhat moderated. However, cold air draining into valleys on cold, still nights can result in very low minimum temperatures. Temperatures of between -15°C and -22°C have been recorded in the Perisher Range area (Ruddell *et al.* 1990).

Meteorological data collected in the Perisher Valley and at Guthega Power Station, including mean daily maximum and minimum temperatures and the daily mean temperature, on an annual and a seasonal basis, are shown in Tables 5.3 and 5.4.







Season	Temperature		
3683011	Mean Daily Max (°C)	Mean Daily Min (°C)	Daily Mean (°C)
Summer	17.2	4.9	11.7
Autumn	11.3	1.0	6.3
Winter	3.0	-4.3	-0.7
Spring	9.3	-0.1	4.7
Annual	10.2	0.4	5.5

Table 5.3 Temperature Data for Perisher Centre (1986-1997) (Source: Bureau of Meteorology)

Table 5.4 Temperature Data for Guthega Power Station (1953-1987) (Source: Snowy Mountains Authority)

Season	Temperature		
3683011	Mean Daily Max (°C)	Mean Daily Min (°C)	Daily Mean (°C)
Summer	20.3	6.4	13.3
Autumn	14.1	2.4	8.2
Winter	6.1	-2.8	1.7
Spring	12.7	1.6	7.1
Annual	13.3	1.9	7.6

5.6.2 Precipitation

Precipitation is greatest in the Perisher Range Resorts during the winter months, usually falling as snow (Ruddell *et al.* 1990). Transpiration, a major form of water loss in other areas, remains low all year round in the alps due to low daytime temperatures. Topography constitutes a major control on the amount of precipitation received with the greatest falls being recorded at high elevations with a north-westerly orientation. Depending on the type of mountain range, the topography may block, deflect or separate the oncoming airflow.

Detailed studies on the annual rainfall experienced in the Snowy Mountains have been undertaken by Walsh (1961) and Gaffney (1971). Table 5.5 (overleaf) shows the average total precipitation for Perisher Valley and the Guthega Power Station. Data for Perisher Valley also includes the average number of snow days.

Casaan	Precipitation		
Season	Average Total (mm)	Average No. Snow Days	
Perisher Valley			
Summer	286	1.8	
Autumn	403	64	
Winter	656	42.4	
Spring	595	19.5	
Annual	1940	127.7	
Guthega Power Station			
Summer	283	No Information Available	
Autumn	401	No Information Available	
Winter	541	No Information Available	
Spring	526	No Information Available	
Annual	1751	No Information Available	

Table 5.5 Precipitation Data for Perisher Valley and Guthega Power Station

5.6.3 Snow Cover and Depth

Snow cover quality can be assessed by measurements of snow depth, areal extent and duration. Individual indices of quality can include the maximum snow depth measures at a particular location for an entire season or the snow depth measured at a particular location at a fixed point in time.

The alpine climatic zone is defined as having, on average, continuous snow cover for at least one month of the year. The snow season generally occurs from June to October, with deep snow cover usually beginning in early July (Ruddell *et al* 1990). In the study area (elevations of 1600-1800m), snow patches usually remain until about mid-October to early November although conditions may vary between locations and from one year to another.

Within the Perisher Range Resorts there is great variability in snowfall and hence snow cover. Records taken at Spencers Creek, between Perisher Valley and Charlottes Pass, indicate the high variability between seasons. The mean maximum depth of snow for the period 1992-1996 was 212cm and the mean snow cover duration was approximately 163 days.

A study investigating snow drift in the resorts area is currently being prepared. The aim of the study is to identify any potential building / development sites associated with the village development which experience problems associated with snow drift (eg snow build-up and clearing).

5.6.4 Climate Change

Future climate change due to an enhanced greenhouse effect would be expected to have significant implications for the tourism industry in the Australian alpine regions (Konig 1997). Studies on the impacts of climate change due to the enhanced greenhouse effect on the snow-pack in Australia suggest that climate change would increase the frequency of winters with little natural snow (Haycock *et al.* 1994; Whetton *et al.* 1996). Under this climate change, the alpine tourism industry would have to deal more often with shortened and more marginal ski seasons. This is expected to reduce the number of skier days in resorts, despite extensive snow-making, resulting in negative impacts on tourism businesses (as seen in the poor snow seasons of 1988 and 1993).

A study of the ski slope capacity at resorts in Kosciuszko National Park (Ecosign 1989) predicted that a 2°C increase in temperature would cause the elevation of the snow line to rise by approximately 250m. Furthermore, such a temperature increase would substantially reduce the number of snow-making hours available during winter. The study concluded that it would be doubtful that snow-making would be economically viable assuming a 2°C warming. In 1988, a similar study conducted by Galloway showed that, given a rise in temperature by 2°C, the mean duration of snow seasons at three resorts would decrease from 135 days to 60 days at Hotham, 130 days to 60 days at Perisher-Blue, and 81 days to 15 days at Mt Selwyn. This study also calculated the area suitable for cross-country skiing in NSW would be reduced from approximately 1400 to 270km².

More recently, Konig (1997) undertook a study looking at the effect of a temperature rise on several ski resorts in NSW and Victoria. The results of this study are presented in Table 5.6 in relation to the financial viability of a ski industry at each resort.

Resort	Best Case 2030 +0.3°C / 0%	Best Case 2070 +0.6°C / 0%	Worst Case 2030 +1.3°C / -8%	Worst Case 2070 +3.4°C / -20%
Charlotte Pass	+	+	+	-
Thredbo	+	+	?/+	-
Perisher-Blue	+	+	?/+	-
Falls Creek	+	+	?/+	-
Hotham	+	+	?/+	-
Mt Buller	+	?/+	?	-
Mt Buffalo	+	?/+	-	-
Selwyn	+	?	-	-
Mt Baw Baw	-	-	-	-

Table 5.6 Prerequisites of Ski Fields in terms of Natural Snow-cover Duration for a Financially Viable Ski Industry

Note: X°C indicates the change in temperature; X% indicates the changes in precipitation.

(+) indicates that the prerequisite in terms of natural snow-cover duration for a financially viable ski operation are accomplished (?) indicates that the prerequisite in terms of natural snow-cover duration for a financially viable ski operation are questionable

(-) indicates that the prerequisite in terms of natural snow-cover duration for a financially viable ski operation are not accomplished

To achieve financial viability at the resorts it was assumed by Konig (1997) that a minimum of approximately 60 days of operation per ski season is required.

Apart from the financial considerations of the ski industry with respect to climate change, the vegetation of the alpine country is also likely to be significantly affected by a warmer climate. In particular, the subalpine forests of the Australian Alps are sensitive to climate change (Banks and Smith 1998). The subalpine snow gums form four major ecological boundaries about their extremity, namely the upper treeline, the inverted treeline, the lower snow gum forest boundary and the 'finger' stands. Assuming a rise in temperature of 0.3-1.4 °C by 2030 (and double that by 2070), the following effects would be evident upon the subalpine snow gum communities:

• Elevated mean summer temperatures would allow the upper treeline to migrate upslope as favourable tree seedling conditions establish and effectively decrease the already limited area under alpine conditions.

- The frequency, severity and seasonality of low temperature events are important in controlling the stability of the inverted treeline. An increase in temperature and reduction in severe cold events would lead to instability of the inverted treeline.
- Rising temperatures and other associated changes in climate would cause instability in the lower snow gum forest boundary allowing lower altitude species to move upslope into the subalpine snow gum forest.
- The 'finger' stands would most likely be affected by changes to exposure of severe cold events rather than rising mean annual temperatures. The change of exposure would result in instability of these areas as with the inverted treelines.

Other vegetation communities, such as the bog and fen associations would also be affected by an increase in temperature.

5.7 Implications for Ski Resort Development

The main planning implications can be drawn from information presented on the natural environment of the resorts area:

- All development or land use plans must specifically take into account provisions contained within the various Recovery Plans (currently available for Mountain Pygmy-possum, Corroboree Frog, Forest Bats and Alpine Flora).
- Many significant natural features, including geological and vegetation communities, have been
 identified within the resorts area. Any development or land use plan should protect these features
 and mitigate any indirect impacts.
- Development within the resorts area must not compromise the survival of any of the threatened flora or fauna species present or likely to occur.
- The aquatic environment of Perisher Creek is already under considerable stress from land use and development in the resorts area (including the STP). Future land use and development plans should actively contribute to improvement in the quality of wetlands and waterways in the study area.
- Development plans should consider entire vegetation communities, not just individual threatened species, which are often significant in their own right. Within the resorts area, vegetation communities of particular significance include bogs, fens and short alpine herbfield.
- Development must be in accordance with the KNP Schedule of Significant Natural Features which specifies in which areas development is not permitted.
- No development should be planned within the 1 in 100 year flood area of Perisher Creek.
- A flood analysis is required for Smiggins Creek to confirm suitability of development at Smiggin Holes.
- Site investigations are required to assess the risk associated with any proposed land use or development proposal in defined hazard areas (refer Figure 5.9).

6.1 Definitions

The heritage qualities of any given place can relate to either natural or cultural values. Natural heritage values are those that are attributed to non-human components such as flora, fauna, ecosystems and geology.

Cultural heritage means components that relate to human values, such as historic, built, landscape, social and behavioural. It is inclusive of all human heritage including indigenous Australian populations, past and present. The information relating to Aboriginal heritage is often to be found through archaeology, as well as through verbally gathering data from remaining tribal / clan members.

It is also to be remembered that heritage does not only imply ancient. Components of heritage value can be simply defined as 'things we want to keep for future generations'. In the context of the planned future change to the resorts area, it is important to identify those components that are of importance to us for future generations, and the measures required to conserve them.

6.2 Indigenous Heritage

This component of the Environmental Study was completed by Navin Officer Heritage Consultants, a specialist in local indigenous heritage and archaeology. A summary of the major findings is outlined below and a full copy of the report is contained in Appendix A.

6.2.1 Study Components

The Indigenous Heritage Study involved four main analytical components:

- Review of previous work including previous archaeological survey results and site models.
- Consultation with and participation of representative Aboriginal Community Groups.
- Conduct of archaeological sub-surface testing with the aim of identifying potential landform based variables relating to archaeological sensitivity.
- The identification and mapping of known and potential areas of Aboriginal cultural heritage value.

6.2.2 Issues Raised by Aboriginal Consultants

Representatives of the Monaro Ngarigo Cheruipin Council and the Bega Local Aboriginal Land Council participated in the field investigation and initial discussions regarding the study and its findings. The following points summarise the issues raised by the Aboriginal consultants:

- The Snowy Mountain alpine and sub-alpine regions are of high cultural significance to the descendants of the Aboriginal tribal groups who occupied and visited them.
- The study area forms part of a wider alpine and sub-alpine Indigenous cultural landscape which includes places and pathways of special cultural significance: some remembered in oral tradition, some documented in nineteenth century records, and some revealed by archaeological investigation.
- Aboriginal cultural heritage values within the study area are manifest by the continuity of Aboriginal history represented by the natural environment (landscape, habitat, plants and animals) and traces of past occupation (revealed by archaeological investigation).
- Concern was expressed at the extent of previous development impact within the Perisher Range Resorts and the possible impact this may have had on the archaeological record.

- The conservation of Aboriginal sites and the natural components of the broader cultural landscape is a primary objective and a major concern.
- All development works within the Park should be preceded by an assessment of potential impacts to Aboriginal cultural heritage values.
- The protection of Aboriginal sites from development impact is a primary management preference. The salvage of archaeological material prior to development impact may be justified in certain circumstances, depending on their assessed significance and the views of relevant Aboriginal representatives.

6.2.3 Results from Previous Investigations

Prior to the present investigation, eight archaeological investigations had been undertaken within the study area. All but one were related to the assessment of potential impacts from ski resort and slope development. All investigations were based on surface archaeological survey and involved small defined study areas. As a result of previous surveys, five archaeological sites, two isolated finds and two potential archaeological deposits have been identified within the study area. All artefact occurrences (with the exception of one isolated find) occur on saddle or ridge and spurline crest topographies.

One site, consisting of a surface scatter of 39 artefacts at Perisher Gap, was recorded by Flood in the 1970s (Flood 1980). The remaining recordings were made in 1999 by Navin Officer Heritage Consultants and consist of four surface scatters of 12, 10, 3 and 2 artefacts respectively and two isolated (single) surface finds. All other surveys had not detected sites. All previous investigations had encountered poor levels of ground surface visibility whilst relying upon surface survey as their only means of site detection. As a consequence, the predictive modelling generated by previous work was mostly untested, based on negative evidence, and constrained by a lack of sub-surface data.

6.2.4 Field Methodology

The methodology for the study was developed in consultation with the NPWS with a focus on the development of a predictive model based on the results from a program of sub-surface testing across selected landform variables.

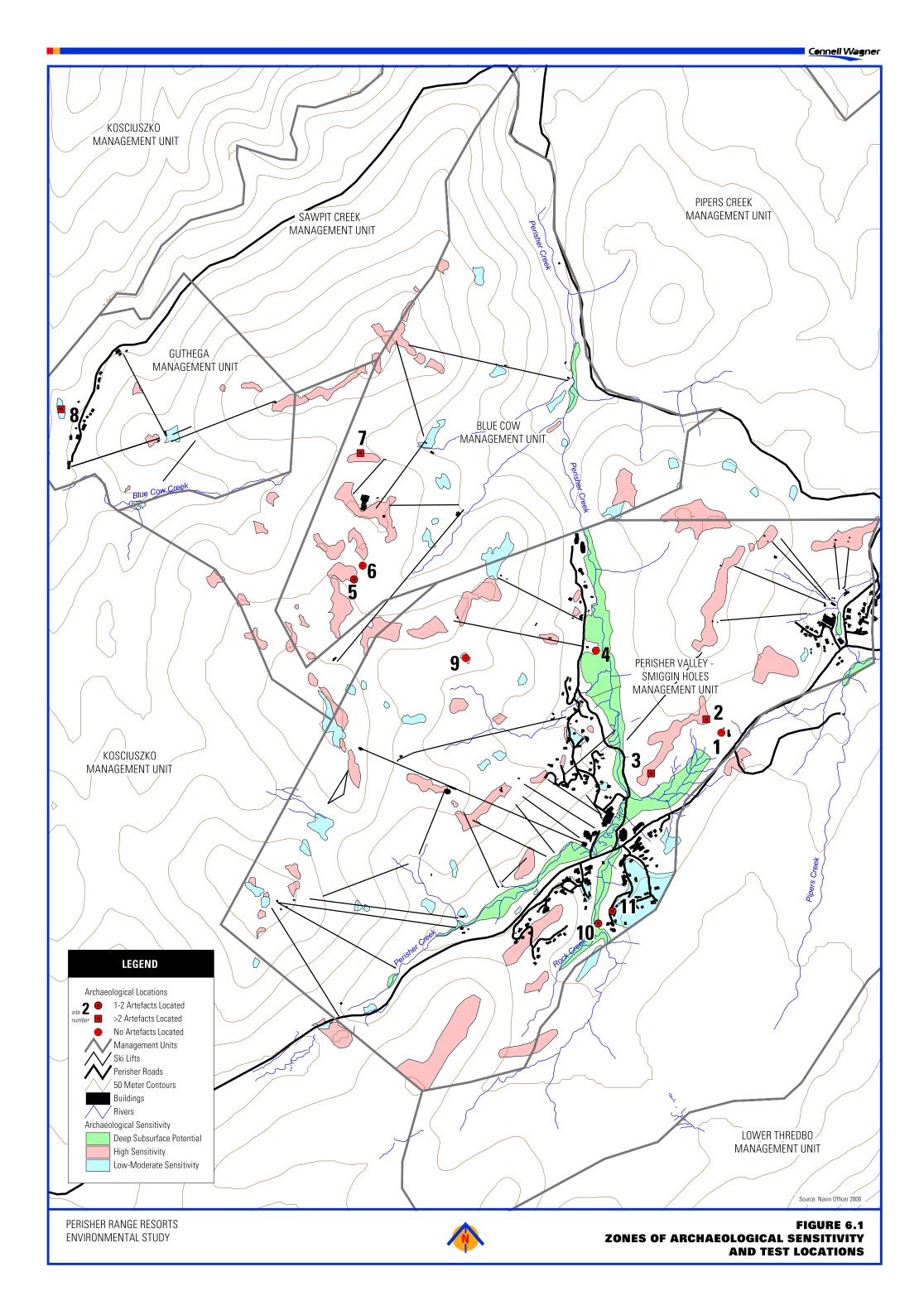
The investigation conducted 37 test pits spread across eleven different locations across the study area. Four pits were conducted in eight of the test locations, with the remaining locations containing two or one pit. Pits were mostly 400 x 400 mm in area and dug by hand. Details of the field test methodology can be found in the full report contained in Appendix A.

6.2.5 Results and Predictive Statements

Artefacts were detected within 12 of the 37 pits conducted (refer Figure 6.1). One previously recorded potential archaeological deposit (PAD2, in Navin Officer Heritage Consultants 1990) was tested and found to contain sub-surface artefacts. Ninety four percent of artefacts were of quartz, with two artefacts made from a fine grained volcanic rock. The quartz, and possibly also the volcanic rock, was most likely derived from local sources. The artefact densities were generally low, and indicative of short term occupation by small groups. Figure 6.1 also shows the zones of archaeological sensitivity within the resorts area.

The following conclusions regarding the occurrence of archaeological sites and Aboriginal artefacts within the study area can be made (refer Figure 6.1):

 No artefacts were located in test locations situated on treeless, valley floor (frost hollow) contexts, either in locally exposed or sheltered aspects.



- Artefacts were consistently found in locally sheltered locations, and rarely in open aspects, within basal and mid valley slope contexts, in woodland characterised by a grassland or a herbfield understorey.
- Artefacts are more likely to be detected in woodland characterised by a grassland or herbfield understorey, than in similar topographic contexts vegetated by dense or closed heath communities.
- Distance from a major water source, such as a drainage line, does not appear to be a significant site location determinant.
- Within relatively flat, well drained ground within sub-alpine (non-heathy) woodland, smallscale topographic variation providing shelter from prevailing westerly and northwesterly weather was the most effective determinant of artefact occurrence.
- Within the alpine zone (>1850 m), artefacts occur at very low densities, in both locally sheltered and open aspects, within relatively flat, well drained (non-heathy) woodland contexts.
- Artefact densities may increase in open aspect and locally exposed contexts with decreasing altitude.
- The average density of artefacts per site appears to increase with decreasing altitude.
- The following landscape variables, in various combinations, were present at test locations where artefacts were detected:
 - Relatively flat or low gradient
 - Locally elevated or well drained ground
 - Woodland with a grassland or herbfield understorey
 - Locally sheltered (rock tors or adjacent slopes affording protection from the prevailing westerly and northwesterly weather)
- The following landscape variables were absent at test locations where artefacts were detected:
 - Grassland and herbfields within treeless frost hollows
 - Predominant or closed heath vegetation
 - Poorly drained ground (variable not tested)
 - Moderate or high gradients (variable not tested)
- Most artefact occurrences occurred within locally sheltered contexts and did not extend into adjacent open contexts situated on the same (large scale) topographic unit.

6.2.6 Proposed Management Strategies for Defined Zones of Archaeological Sensitivity

The following strategies are proposed for the effective management of the known or potential archaeological resource occurring within the resorts area (Navin Officer Heritage Consultants 2000). Strategies are ordered according to the Zone of sensitivity in which the management area occurs. The Zone areas are shown on Figure 6.1 and described in Section 8.2.3 of Appendix A.

Reference is made to 'relatively undisturbed deposits' in the following strategies. Relatively undisturbed deposits are defined as soil profiles which retain all or part of the natural vertical sequence from topsoil to subsoil.

Deposits or landsurfaces which do not fall into this category include:

• Landfill which does not include buried former landscapes

- The immediate area and displaced ground around buildings, tanks and tower/pylon sites and their foundations
- Quarries and similar excavations
- Surfaced vehicle tracks where the subsoil has been removed

Zone Containing Areas of High Archaeological Sensitivity

- A cultural heritage assessment of the potential impact to Aboriginal sites is required for all
 maintenance or development works which will involve landsurface disturbance to relatively
 undisturbed deposits or tree clearance within this zone. This assessment should include
 subsurface testing in areas with predicted archaeological potential.
- Where feasible, new developments and planned structures within this zone should be designed and placed in such a way that direct impact to areas of archaeological potential is avoided or minimised. Greatest priority should be given to avoiding impact to the immediate area of shelter from the prevailing weather which may be afforded by rock tors and microtopographic features (where this does not occur within poorly drained ground).
- Known Aboriginal sites within this zone, which are not the subject of a Consent to Destroy
 from the NPWS, should be actively conserved. Appropriate conservation strategies will
 vary according to the nature and context of the site and should be formulated in
 consultation with NPWS. Activities which may initiate or exacerbate soil erosion may need
 to be excluded from the known area of the site. Any existing soil erosion processes should
 be actively controlled, minimised or prevented.

Zone Containing Areas of Low to Moderate Archaeological Sensitivity

- A cultural heritage assessment of the potential impact to Aboriginal sites is required for all
 maintenance or developments works which will involve landsurface disturbance to relatively
 undisturbed deposits or tree clearance in this zone. This assessment should include
 subsurface testing in areas with predicted archaeological potential.
- Where feasible, new development and planned structures within this zone should be designed and placed in such a way that direct impacts to areas of archaeological potential is avoided or minimised. Greatest priority should be given to avoiding impact to the immediate area of shelter provided by rock tors and micro-topographic features (where this does not occur within poorly drained ground).

Zone Containing Areas with Potential for Deep Subsurface Archaeological Deposits

- The requirement for an archaeological assessment prior to the conduct of works involving landsurface disturbance to relatively undisturbed deposits should be determined following liaison with NPWS.
- The requirement for a surface archaeological survey in areas with minimal ground surface visibility is considered to be low.
- All excavation works within this zone should be appropriately monitored by a suitably qualified archaeologist, and where appropriate, a representative of the local Aboriginal community. An archaeologist with some geomorphological training would be an advantage in this role. The monitoring program should have the following aims:
 - The detection and recovery of artefacts which may have been preserved within waterlogged sediments (there is limited potential for preservation of wooden and organic artefactual materials within wetland deposits).
 - The detection of well preserved palaeosols (fossil soils) which are indicative of former, well drained land surfaces (but excluding profiles which have formed in poorly drained

or wetlands contexts). There is limited potential for the preservation of these features within this zone. Palaeosols derived from formerly well drained landsurfaces may have considerable archaeological potential and should be archaeologically tested prior to destruction.

- If Aboriginal artefacts or a palaeosol with archaeological potential is detected, then all development works which may impact the find(s) should cease until its archaeological potential and significance has been adequately assessed, and if necessary, an appropriate management strategy enacted. This would normally require sieving samples of the deposit according to an archaeological methodology to determine the nature of any artefacts present.
- The detection and assessment of palaeosols would be aided by the conduct of sediment coring and a review of the core records, prior to full-scale excavation works.

Zone with No or Negligible Archaeological Potential

- The requirement for an archaeological assessment prior to the conduct or works involving landsurface disturbance to relatively undisturbed deposits or vegetation clearance should be determined following liaison with NPWS.
- The requirement for a surface archaeological survey in areas with moderate to high slope gradients, and/or poorly drained ground, is considered to be low.
- The requirement for a surface archaeological survey is considered to be high in areas which contain either a significant proportion of surface rock exposure and rock tor relief, and/or old growth trees. There is some limited potential associated with these landscaping traits for the occurrence of rare Aboriginal site types such as rock shelters with deposit, stone arrangements, and Aboriginal scarred trees.

6.3 Non-Indigenous Cultural Heritage

6.3.1 General

Research into cultural heritage within the Park is limited to date, with a body of written documents (refer Section 12) that concentrates on the historic and architectural built heritage.

A wealth of unsystematically documented social and historical data resides within the community, in various books, pictorial essays and in the data banks of other agencies (eg. Snowy Mountains Authority). However, this has not been collated for the Park as a whole or for the Perisher Range Resorts.

In the data currently held by NPWS relating to cultural heritage, and in the context of the Perisher Range Resorts, the issue least conclusively addressed is the landscape. Along with consideration of the built heritage this is likely to have the most potential to affect the future direction of development within the study area. Accordingly, the following discussion focuses on these issues.

6.3.2 Architectural Built Heritage

The work of Peter Freeman Pty Ltd and his team in the "Ski Resorts Heritage Study" applied the NSW state heritage criteria, and defines the buildings that are of heritage significance (ie. state, regional or local level). The volumes record the noteworthy architectural features of individual buildings, providing a classification of design for each building within the resort areas.

This study builds on a range of documentation to provide the social and historical context for the resorts as they are today.

6.3.3 Cultural Landscape Heritage

The cultural and the natural landscape are intertwined and a clear boundary between these two types of landscape cannot generally be made. The landscape has been substantially modified in certain areas, by grazing, by human habitation, by the placement of structures in associated with recreation and with infrastructure development. There are areas where the development of the ski fields, and the remains of the activities of the Snowy Hydro-electric Scheme, are visible and distinctive. The extent of the area is usually able to be identified through a change of plant species, or as in the Perisher Valley, the presence of large areas of paving and many buildings.

Though evidence of indigenous peoples use and inhabitation of the place has been established, the results of the archaeological studies done to date in the Park do not provide information to definitively indicate where, and what kind of effect if any, the Aboriginal populations may have made to this landscape. However, the paucity of documented information regarding their use and management of the landscape is not evidence that it did not happen. The last one hundred and fifty years of changed management resulting from white settlement nearby, different fire regimes and grazing, is also likely to have modified the landscape thus obscuring the previous condition.

The criteria for assessment of heritage significance under the State Heritage Register are directly applicable in the Park. However, Kosciuszko is a National Park of undisputed national significance. In addition, the Park is a signatory to cross border agreements with the agencies responsible for the remaining alpine areas of Victoria and the ACT. It is therefore prudent and feasible to assess the place against the criteria set out by the Australian Heritage Commission, for the Register of the National Estate (RNE). Currently, the Park is registered on the AHC's RNE, with a Statement of Significance that is broad ranging. The State and Federal government agencies have different wording in their criteria and this often results in different assessment of details in the Statement of Significance.

The range of documents reviewed clearly identified the qualities of the landscape that were distinctive and valued by the range of stakeholders, including the impact of the buildings as groups within the landscape, an understanding of the form and characteristics, and has descriptions of the landscape setting to the resort areas.

This body of work has, however, no landscapes or non-built historic sites assessed as being significant, or otherwise, under any heritage criteria. It is important for the Park that a level of significance is ascribed, that is local, state or national, to any areas found to be culturally significant. A full assessment and analysis of the cultural landscapes against both state and national criteria needs to be undertaken.

6.3.4 Visual Appreciation of the Landscape

The landscape and its components are not homogenous within the Park's management units. There are numerous plant communities that create distinctive landscapes across the unit boundaries. In the work by Jackson Teece Chesterman Willis (JTCW 2000), visual catchment boundaries have been identified for the Perisher Valley area, and a visual analysis done for the area likely to be affected by resort redevelopment. Irrespective of wilderness (natural heritage) and cultural heritage status, the landscape of the study area is one that is valued by a range of people, all 'stakeholders' in the place. There are three primary types of viewers of the landscape:

- Those driving through on the main route, known as Kosciuszko Road.
- Those recreating (skiing or walking) with the area, usually on the higher ground.
- Those residing in the area for varying periods of time.

The key viewing points vary with these three groups as does the level of detail that they are able to perceive (Figure 6.2). The JTCW (2000) report establishes a method for the assessment of the visual qualities of the landscape and determines a desirable location for redevelopment based on the appearance of the place from the key viewing points for all three types of viewers.

The report identified a number of views where the existing Perisher Valley resort has a negative (undesirable) visual impact, and provided development strategies aimed at landscape improvement. The recommendations explored options that range from removal of existing structures, to the urban design form and landscape unit management guidelines.

6.4 Implications for Ski Resort Development

6.4.1 Indigenous Heritage

- The surviving archaeological resource within the study area is a culturally significant component of the alpine and sub-alpine Aboriginal cultural landscape. The proven occurrence and distribution of sub-surface artefacts within the alpine and sub-alpine environment provides both a marker of past Aboriginal occupation and an opportunity to study Aboriginal adaptation and exploitation of the high country.
- The conservation of Aboriginal sites within the study area should be a management objective and a planning strategy priority.
- Development within treeless, (frost hollow) valley floor and basal slope contexts are unlikely to impact Aboriginal archaeological sites. Possible (but probably rare) exceptions to this may be artefactual material contained in remnant palaeosols (fossil soils) situated at depth within valley infill sediments, and organic artefacts conserved in wetland and peat bog sediments.
- Development of poorly drained and/or moderate to steeply graded slopes such as would apply for the envisaged Perisher Village concept is unlikely to impact on Aboriginal archaeological sites.
- Disturbance to locally sheltered, relatively level and well drained ground, within elevated grasslands or grassy woodland is likely to impact on Aboriginal archaeological artefacts.
- Development within the zones of archaeological sensitivity must be in accordance with the management strategies outlined in Section 6.2.6 of this report.

6.4.2 Non-indigenous Heritage

Further work is suggested in the following areas to fill gaps in the data and to assist in the conservation of the place:

 An assessment of the landscape of the place against both NSW and RNE heritage criteria and a determination reached as to the areas of cultural heritage significance, if any, and their level of significance.

- Landscape unit (visual catchment / plant community) identification, and conservation strategies for each village, in particular related to the management objectives of both the Park and the resort operators.
- A visual assessment of the Smiggin Holes and Guthega areas and recommendations regarding the urban design guidelines for conservation and development of this resort, to follow the method established by JTCW.
- A visual assessment and guidelines for the conservation and development of the landscape of the approach by road to the Resort Area, taking account of potential increased recreational visitation in summer and winter.

6.4.3 Landscape Heritage

The following points summarise the landscape implications and desirable objectives of any changes to the resort areas.

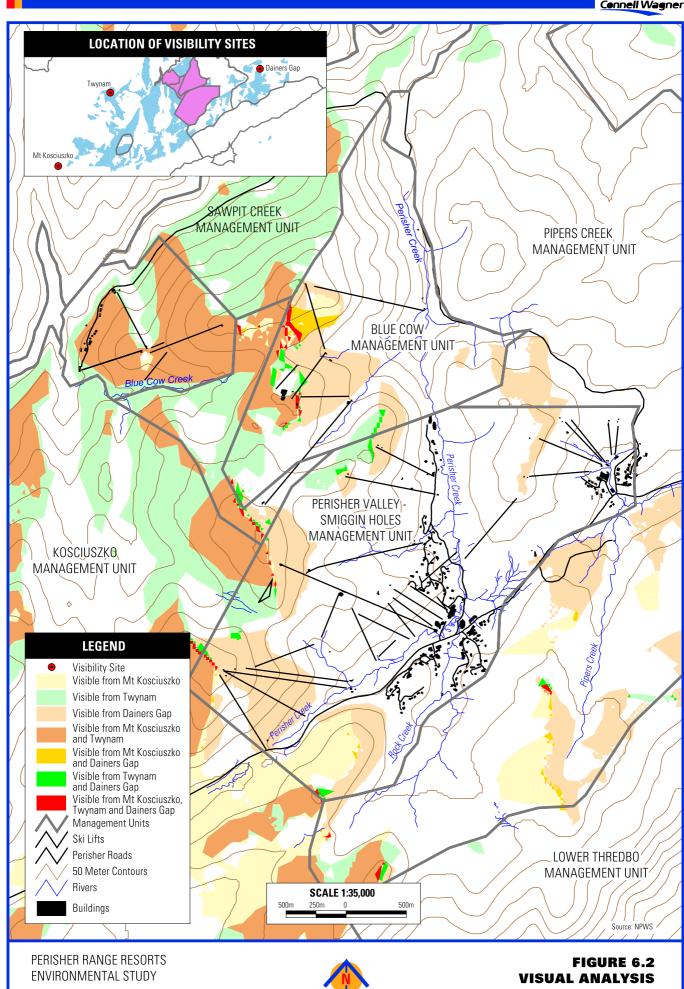
- Individual identity for the Perisher Valley, Smiggin Holes and Guthega resort areas is derived from the landscape, and the pattern of placement, and the scale of the buildings within them. Retention of these distinct and different identities for each resort is desirable.
- The landscapes of the existing resort areas are cultural landscapes of distinction (heritage significance not yet fully assessed), that contribute to the significance of the buildings within their settings. Management of these landscapes should conserve the dominant natural distinguishing features and disallow increase in density of buildings.
- Viewing points into and from the various places within the study area are critical to both the
 appreciation of the place and perceptions of the management, both of the national Park
 and the Resort complexes. Actions should be taken to ensure that key view points are
 retained for this purpose, and that the important qualities of these views from these places
 are recognised, and enhanced not compromised or diminished, by any redevelopment.
- The mode of arrival to the study area determines what is seen and perceived, by workers, visitors and residents. The experiences and sense of arrival is quite different by rail and road, and in winter and summer. For travellers by road, the landscape provides the setting for the experience, and builds the sense of anticipation. Deliberate attention to the needs of drivers, for safety and clarity of destination / arrival, plus control and enhancement of the scenic experience, should be given for the entire study area.
- Retention and conservation of the snow gum woodland, and preferably with the native understorey species, throughout the residential precincts and recreational areas. These areas contain both deliberately and accidentally introduced urban exotic plant species. These require deliberate action in public education and weed eradication programs.
- Remediation of Perisher Creek to provide a dominance of native plants along its banks. This would restore a landscape component previously damaged, and provide a place with appeal and attraction for the Perisher Valley resort.

6.4.4 Built Heritage

In the work by Peter Freeman and team, the recommended policies for the resort areas range from natural resource management issues through to business guidelines. The following points summarise the key recommendations and desired objectives of the range of documents reviewed, that relate to built heritage and are likely to impact on any changes to the resort areas:

• The current pattern of development of the lodges, with the concept of visual seclusion and discrete grouping amongst natural features, should not be compromised by the allocation of new leases to permit infill or provide greater density within the existing resort areas.

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- Retention of a mixture of ownership (including private ski clubs) within each resort area to ensure the retention of the historic and social heritage of the pattern of development, and continuity of social mix.
- Conservation and management of the buildings nominated as state or regionally significant in the Freeman study.

This section summarises the existing utility services and facilities within the Perisher Range Resorts and identifies proposed upgrade works and other related matters that will influence future development plans in the area. The various services and facilities include water supply, sewerage system, drainage controls, power supply, communications facilities, gas supply and solid waste. Figure 7.1(a-c) shows the location of the various utilities, roads and carparks throughout the resorts area.

7.1 Water Supply

The main Perisher water supply is sourced from a weir located on Rock Creek, which discharges via a 200mm diameter pipeline to a nearby 7.2ML off-stream storage. Water is pumped from the off-stream storage via a 150mm diameter rising main to three service reservoirs. The pump station has two pumps with a rated capacity each of 15.1 LPS (Litres per Second). The service reservoirs have the following capacities: 2 x 78kL and 1 x 102kL. Treatment is via an ultraviolet disinfection unit located downstream on the gravity main outlet from the service reservoirs.

The North Perisher water supply is sourced from a weir located on an unnamed creek. Water gravitates through a 50mm diameter line to two 102kL service reservoirs. Treatment is via an ultraviolet disinfection unit located downstream on the gravity main outlet from the service reservoirs.

The Smiggin Holes water supply is sourced from a weir located on Pipers Creek. Water is pumped through a 100mm diameter line to three service reservoirs which have the following capacities: 2 x 80kL and 1 x 102kL. Treatment is via an ultraviolet disinfection unit located downstream on the gravity main outlet from the service reservoirs.

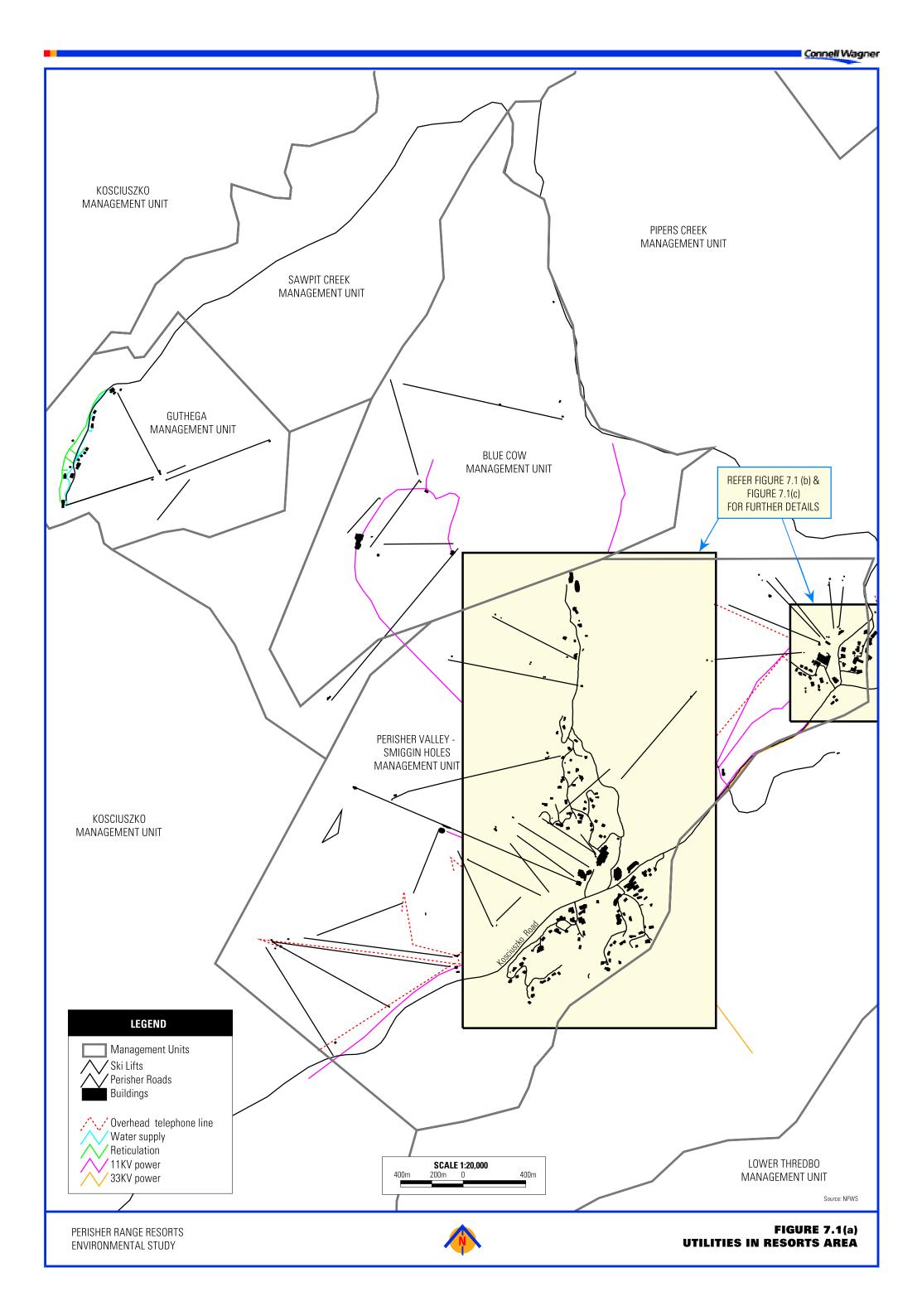
The Guthega water supply is sourced from a weir located on Farm Creek. Water gravitates through an 80mm diameter line to 2 x 86 kL service reservoirs. Treatment is via an ultraviolet disinfection unit located downstream on the gravity main outlet from the service reservoirs. The water supply to the Blue Cow terminal is operated and maintained by Perisher Blue P/L.

A level of augmentation and upgrading of the existing water supply system is required to meet municipal water supply standards. In addition, expansion of the system will be required to meet the demands of additional overnight visitors associated with new beds in the resorts area and to provide greater security of supply during prolonged drought periods. The Master Plan EIS (Kinhill 1997) identified a three pronged approach to meeting future demands. This involved:

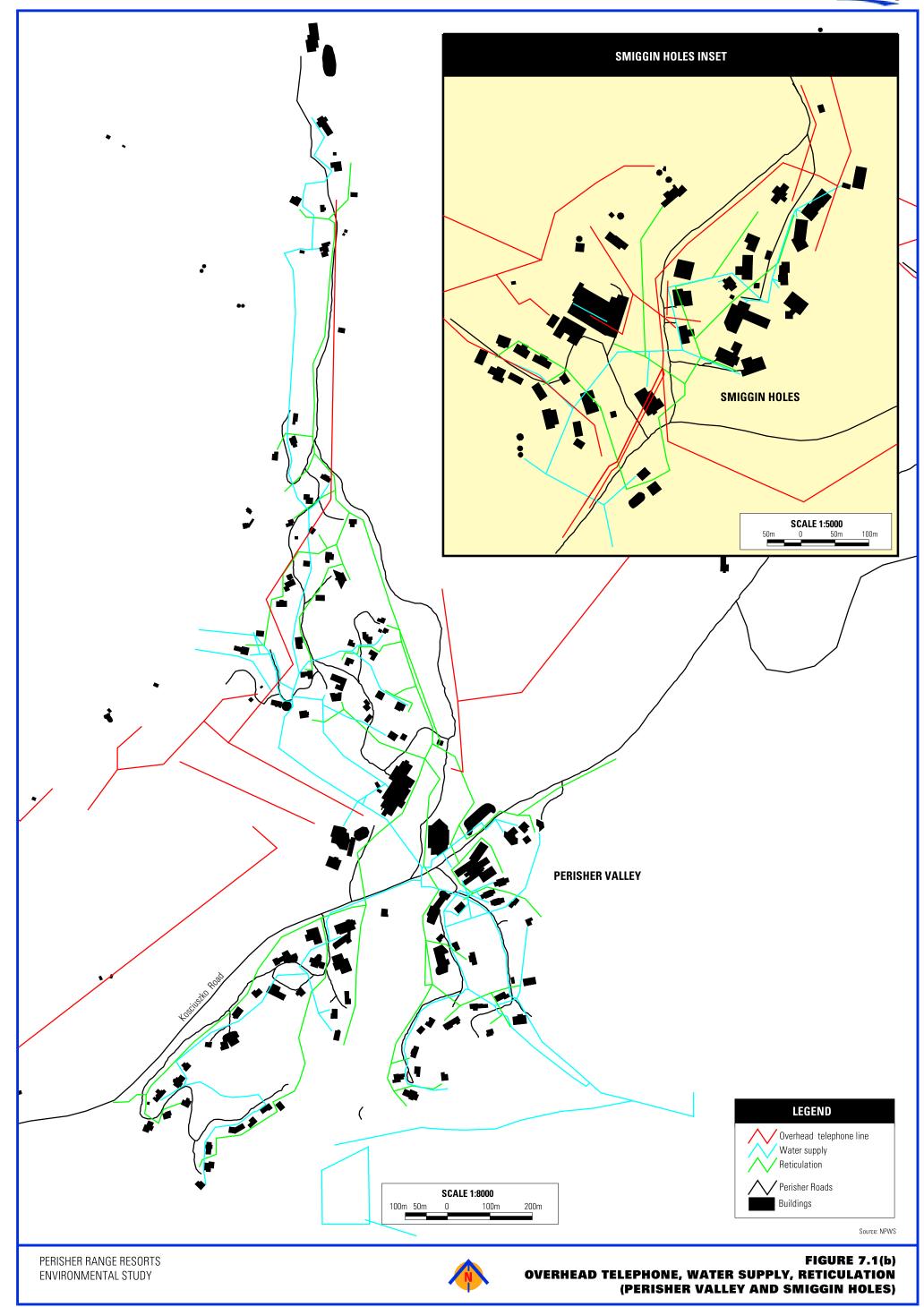
- Increasing capacity at the off-stream storage adjacent to Rock Creek.
- Increasing the number and capacity of service reservoirs.
- Introducing demand management measures to regulate water use more efficiently.

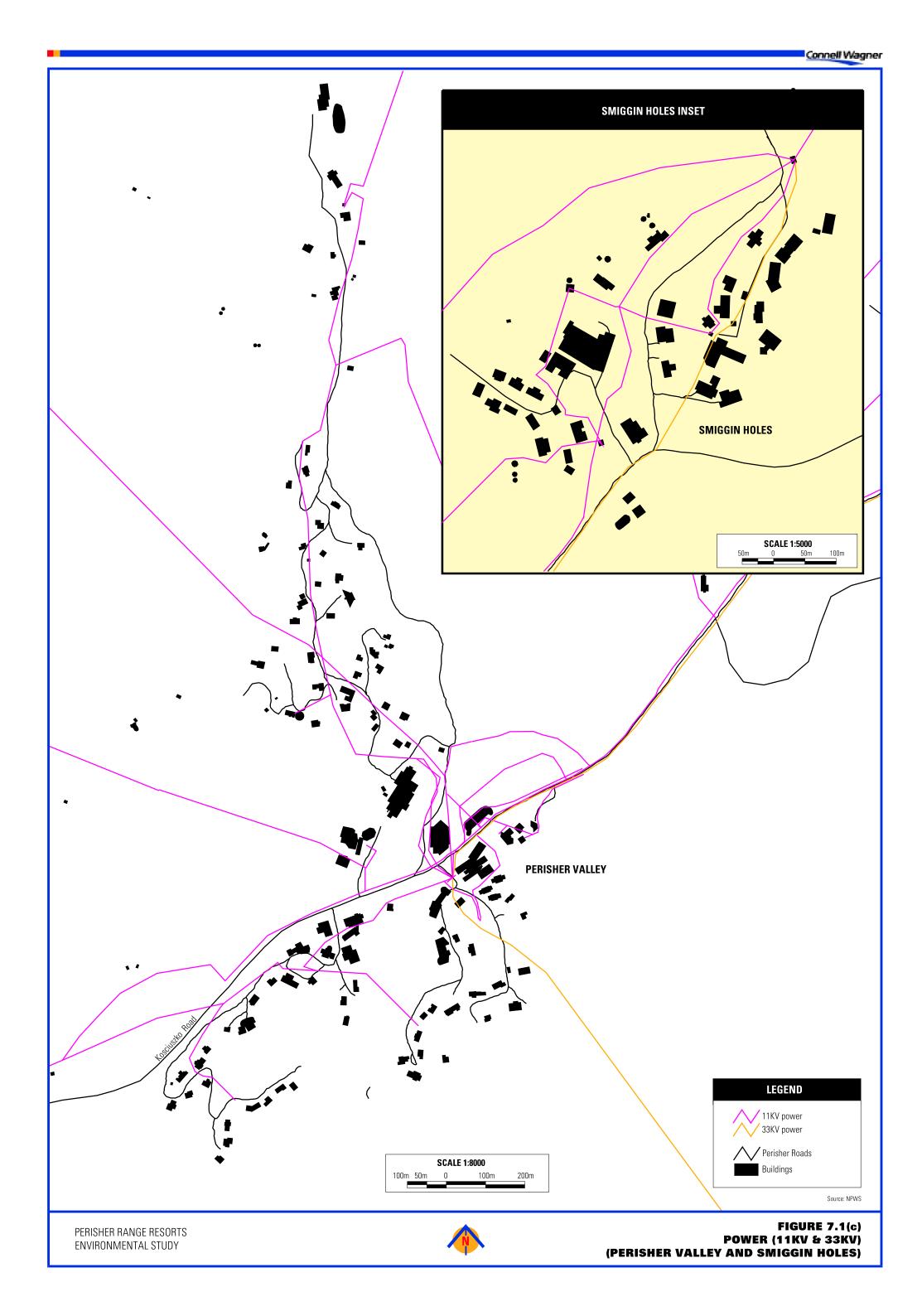
Current capital works by NPWS include the laying of a 100mm diameter main extending from The Man from Snowy River Hotel to the fire station within Perisher Valley. Future capital works will involve upgrading of the Rock Creek storage reservoir and the service reservoirs.

The 1997 Master Plan EIS identified the existing reticulation system at Perisher (and North Perisher) as highly prone to leaks and breaks due to poor quality and age of pipeline materials, and incorrect laying procedures at the time of installation. The reticulation system to Smiggin Holes and Guthega are considered by NPWS operations staff to be operating satisfactorily. No information is currently available on the performance of the Blue Cow system. Maintenance for the systems is carried out by NPWS during the summer period.



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NPWS has engaged Snowy Mountains Engineering Corporation to undertake a water supply study for Perisher Valley and Smiggin Holes investigating a worst-case drought scenario. The report will be published towards the end of 2000.

7.2 Sewerage System

The existing sewerage system comprises a sewage treatment plant (STP) at Perisher Valley and various pumping and transfer stations throughout the resort area. The stations convey sewage flows from the resorts to the STP via a series of gravity and rising mains.

The Smiggin Holes pumping station is located on the southern side of Kosciuszko Road and receives flow from its immediate catchment, comprising the resort area. The station pumps to a discharge manhole from where sewage gravitates to Perisher pumping station No. 2 (PS2).

Perisher pumping station No. 3 (PS3) is located near the Mt Perisher double chair lift and receives flow from its own local catchment. Flow is pumped to a discharge manhole where it gravitates to Perisher PS2.

Perisher PS2 is located to the northeast of the Perisher Ski Centre and receives flows from Perisher PS3 and Smiggin Holes, as well as its own local catchment. The station pumps to a discharge manhole from where sewage gravitates to Perisher pumping station No. 1 (PS1).

Perisher PS1 is located adjacent to North Perisher Road, south of Peer Gynt Lodge. The station receives flows from Perisher PS2, PS3, Smiggin Holes and its own local catchment. The station pumps directly to the STP.

The Guthega pumping station is located east of Guthega Dam and receives flows from its local catchment, comprising the resort area. The station pumps to a discharge manhole where it gravitates to the Blue Cow transfer station.

The Blue Cow transfer station is located near the Blue Cow Skitube terminal and immediately adjacent to Blue Cow Road. The station receives flows from its immediate catchment comprising the terminal and Guthega resort. Flow from the transfer station gravitates to the STP. Only the Blue Cow Skitube terminal is connected to the sewerage system. The lodges and remainder of the resort are served by a septic tank system.

The existing STP is an intermittent decanted extended aeration (IDEA) process with ultraviolet disinfection of the treated effluent prior to discharge into Perisher Creek. The current average dry weather flow to the STP during the winter season is 1.25 ML/day. The plant has a design capacity of 2 ML/day, which has been exceeded on occasions (during peak flows).

The Environment Protection Authority (EPA) discharge licence limits for the STP have been exceeded on occasions and the STP has also been made subject to effluent standards sufficient to meet EPA sensitive waters criteria.

A sludge handling system needs to be constructed to allow all three existing treatment tanks to be used to treat sewage instead of one being used to store sludge in the latter part of the ski season. This would effectively increase the capacity of the STP to be able to meet the projected demand of additional overnight visitors. The STP also needs upgrading in the level of treatment provided in order to meet EPA sensitive waters criteria.

Capital works to date have involved upgrading and augmenting of the STP. This involves:

- Provision of new inlet works and flow divider, and an additional extended aeration tank (EAT).
- Conversion of the existing catch pond to a catch/balance pond.
- Upgrading of electrical supply and control services.
- Provision of biosolids dewatering and building ventilation facilities.
- Upgrading of site drainage and roadworks.
- Altering the existing building enclosure to meet NPWS Interim Building Code requirements.
- Provision of odour control measures and site landscaping.

Future c apital works to improve the sewage transfer pumping stations include:

- Upgrading of pumping equipment and facilities.
- Building extensions to accommodate new pumps.
- Provision of lightning protection and ventilation.
- Upgrading of wet well and overflow storage.
- Upgrading of electrical supply.
- Provision of site landscaping.

These capital works will improve the system reliability and also enhance Occupational Health and Safety features.

Maintenance is carried out during the summer period on the pipelines, STP and pump stations. The Master Plan EIS (Kinhill 1997) identified most sewer lines at Perisher as capable of receiving flows, with only two lines as being under capacity for current flows and in need of upgrading, unless inflow/infiltration can be significantly reduced. The Smiggin Holes and Guthega reticulation systems were identified as currently operating satisfactorily.

A program of infiltration reduction works including insitu sewer and manhole upgrades has been completed. A monitoring program is underway to determine the effectiveness of these works.

7.3 Roads, Carparks and Drainage Infrastructure

Stormwater drainage infrastructure within the resorts area is limited. Roads are generally provided with table drains with culverts to accommodate cross drainage flows. Car parks and hard stand areas are either sealed or unsealed with some piped drainage. Unsealed roads generally have diversion banks to break up flows and prevent scour/erosion. Several small sediment traps are provided adjacent to roads, car parks and hard stand areas. Kerb and gutter drainage is provided to some sealed roads. The immediate effect of the lack of drainage infrastructure is the discharge of untreated and uncontrolled stormwater runoff into the creek systems. This includes runoff that contains sediment, litter, chemicals and the like.

Future drainage works planned by NPWS for the next 2-3 years include:

- Sealing a number of internal village roads.
- Upgrading drainage and erosion controls on remaining unsealed roads.
- Resealing of car parks in some areas, provision of kerb & gutter, piped drainage and pollution control structures.

A full listing of scheduled and priority drainage improvements is provided in the Stormwater Management Plan for Perisher Valley, Smiggin Holes and Guthega (Water Resources Consulting Services 1997).

Maintenance is generally carried out in the summer months during which time pipelines, culverts and sediment traps are cleaned.

7.4 Power Supply

Electrical power supply to the Perisher Zone Substation (located at Perisher village) is via two 33 kV feeders from the Munyang Zone Substation.

The Perisher Zone Substation contains two 33/11kV transformers each rated at 10 MVA. Supply is reticulated around the resort area at 11kV by six feeders. One feeder supplies the Skitube Traction Station and the other five supply the Perisher Valley, Smiggin Holes, Guthega and Charlotte Pass resorts.

Advice provided by Monaro Electricity (now Great Southern Energy) at the time of the preparation of the Village Master Plan EIS (Kinhill 1997) indicated that the capacity of the feeders should be adequate for the additional accommodation proposed in the Plan (approx. 1000 additional beds).

The low voltage network from individual lodges to their respective substations does not have a lot of spare capacity. New lodges are to be responsible for the cost of providing an adequate supply to their nearest substation.

No capital works are anticipated for the 11kV feeders. Capital works at owner's cost will be required for supply to new lodges. No information is currently available regarding the maintenance of the power supply.

7.5 Communications

Communication facilities comprise Telstra telephone lines including an optic fibre cable feeding into Perisher. Mobile phone facilities (Optus / Vodaphone / Telstra) and radio communications are also available.

The Mount Perisher radio communications base station services the NPWS, NSW Police and Ambulance Services network. Perisher Blue Pty Limited also has a radio base station located on Back Perisher Mountain.

Increased occupancy from additional overnight visitors at the resorts may require upgrading to faster transmittal and receiver speeds, of the transmittal and receiver equipment, at the extremities of the existing optic fibre cable into Perisher.

No effect on the other communication facilities is anticipated. No information is available on plans for future capital works, nor is there any information available on maintenance issues.

7.6 Gas

Elgas provides LPG throughout the Perisher Range Resorts by limited reticulation from large aboveground storage vessels, and from small LPG cylinders located at individual lodges. LPG is trucked in from off-site to fill/refill the storage vessels.

A 15 tonne LPG tank supplies LPG to Perisher Valley via a network of piping and meters to some of the larger lodges and businesses. These include The Man from Snowy River Hotel, Perisher Blue Ski Centre and Ski Tube Building, the Valley Inn, and the NPWS building. A 3 tonne tank at South Perisher positioned close to Ben Bullen Lodge supplies 5 lodges, and a 3 tonne tank also at South

Perisher next to Corroboree Lodge supplies a further 10 lodges. Cylinders ranging in size from 45 kg to 190 kg and tanks from 1 tonne to 3 tonnes are scattered throughout the remaining lodges.

Smiggin Holes, Guthega and Blue Cow all utilise LPG in varying degrees and customers are supplied through individual cylinders or tanks. No reticulation system exists in these particular resort areas.

Ideally gas supply for the resorts should be reticulated from a dedicated tank facility. This would reduce potential hazards of numerous tanks sited throughout the resorts.

The Eastern Gas Pipeline is currently being installed, with the section from Cooma to Bombala under construction. There may be a possibility in future, of a gas take-off to the resorts from the Cooma end of the pipeline, however, no definite plans exist at present.

Elgas proposes to increase the size of the main 15 tonne storage tank at Perisher Valley (to 50 tonne) and relocate to a more favourable position so as to maximise the developments that can be connected in the centre Valley area. The reticulation system would also need to be upgraded and it is proposed that a line some 4km in length be run to the sewage treatment plant.

No information is available on plans for future capital works for the gas supplies to Smiggin Holes, Guthega and Blue Cow resorts.

7.7 Solid Waste

During the winter season, NPWS collects solid waste from a transfer area (containing a number of large compactor bins) which is adjacent to the Perisher NPWS Ranger Station (adjacent to the main Jindabyne-Kosciuszko Road). During the summer months, this transfer area is relocated to outside the Perisher Valley NPWS Office. At Smiggin Holes, waste is collected from compactor bins placed by NPWS at various locations within the village. Waste collection and removal is also undertaken by NPWS at Guthega.

Management issues arising from the existing arrangement include:

- Spillage during oversnow transport from lodges to transfer areas.
- Windblown litter from open and exposed garbage hoppers.
- Conflict between garbage trucks and skiers/pedestrians.

Although the use of the bins is minimal during the summer months, regular transfer by NPWS to the Sawpit Creek Sanitary Landfill site is still required. Solid waste and dried sludge from the Perisher STP are also disposed of at the Landfill. The capacity of the Landfill site is now exhausted, and an alternative disposal facility is required. A regional waste facility that will accept waste from the resorts is planned to be operational in the year 2001.

Capital expenditure will be required for the proposed regional landfill facility. Maintenance issues to be resolved by NPWS regarding solid waste disposal include:

- Relocating compactor bins to less visible sites at Perisher and Smiggin Holes.
- Minimising windblown litter from the compactor bins.
- Relocating solid waste collection and removal points at or as close to the snow line as possible.
- Minimise the waste stream from the resorts.

7.8 Implications for Ski Resort Development

The following implications can be drawn from the results of the infrastructure assessment:

- There is a need for larger focus on co-location (eg telecommunication facilities) and shared facilities/trenches/easements for services to minimise environmental disturbance.
- Need for a strategic plan to address infrastructure needs in the resorts area looking at staged development and the likely ultimate development to cater to the design capacity of 22,000 visitors.
- All services/infrastructure to be closely scrutinised during planning/EIA phase and on a recurrent basis as part of the environmental performance monitoring of the resorts area.
- There is a need for a study to investigate the strategic options for sewerage systems in the resorts area.

8.1 General

Conservation of the landscape is an intrinsic part of the role of the Park's management, as set out in the Kosciuszko National Park Plan of Management.

The important function provided by the Perisher Range Resorts is in providing the facilities and amenities to ensure safe access, educational and memorable experiences for the general populace, and not just recreational skiers and snow boarders. The development of the resorts to better provide for non-snow times of the year is a positive action for equality and breadth of opportunity.

The re-developed Perisher Valley village is to be a place with extensive day car parking, high density accommodation, public transport and utility functions, as well as the recreational / resort infrastructure for year round visitation. The built form, precise location and urban design of this redeveloped village area is the most significant issue for resolution within the resorts area of the Park and is the topic of further study.

The impact on the landscape of this expanded role for the resorts is complex and affects not just the immediate resort areas. Sustainability of this expansion is a key objective as set by the PoM, however the landscape impacts vary with the ecotypes and topography. The focus for this section is the resort village areas, to identify the elements that define the character for the resort villages – Smiggin Holes, Perisher Valley and Guthega.

A range of reports (refer Section 12.8) have addressed many of the issues relevant to urban design, with a convergence of view on some issues and further resolution required in others

8.2 Landscape and Management Units

The management units described in the PoM for the Park relate to the ski resorts and their accommodation and infrastructure. The units were not derived solely from landscape features and do not take particular account of ecological differences within these topographically diverse areas of land. There is a need to develop landscape management units to assist in making decisions about landform and landscape, access and circulation, and where the important natural features and view points are given significance.

The classification of the resort parts of the study area into visual catchment units has been referred to JTCW (2000) and (Kinhill 1997). However, a holistic landscape assessment for the entire study area has not been undertaken.

The areas of the village resorts require a detailed set of landscape guidelines to provide more in depth management strategies that address and permit the retention of the distinctive and individual character of each place. This is particularly relevant to the existing accommodation areas of Perisher Valley in which the accommodation buildings are widely separated and have developed distinctive and individual characters.

8.3 Land Use Distribution within the Ski Resorts

The system of land tenure currently in place in the resorts is of individual leases of varying and limited size. Parcels of land granted by NPWS has largely followed rather than determined the distribution of

accommodation and other buildings in the villages. There are no formal, survey defined road reservation or service easements, but rather leased parcels for each building envelope.

This control and responsibility for all land management matters lies with the NPWS whereas elsewhere it is assumed by head lessees. The lack of definition of road, service and lot boundaries raises issues about responsibility for driveways and services.

8.4 Visual Context

The resorts area is not visually isolated from the rest of the Park. Within the resorts area, views out over the valleys and from the high points to ranges well beyond, are an important and ever changing component of the landscape. Similarly the views obtained into the study area are many and varied depending on the view point (refer Figure 6.2). In the context of potential development, these external view points are critical to the resorts. Section 6.3.5 details the types of viewers and the view sheds that are important to each different group.

The importance of views and vistas to the skiing and other recreational populace cannot be undervalued as part of the attraction of the resorts area. However, use of the resorts during non snow seasons shows up the unslightly development otherwise hidden under a blanket of white. The appeal of the villages as resorts and year round venues, will be limited if the standards of visual amenity, as set by alternative venues such as Thredbo within the Park, are not at least matched.

Visual analysis for the entire study area has not been undertaken. The visual catchments for the three resorts have been identified. The Perisher Range Resorts Master Plan EIS (Kinhill 1997) gives significant attention to the landscape and the visual catchments of the three resorts. A recent document by Jackson Teece Chesterman Willis (JTCW 2000) addresses this issue and nominates the key view points into and from the Perisher Centre Valley area. Similar analysis has not been completed at this stage for other resort areas but will certainly be required to assist detailed planning for Smiggin Holes and Guthega.

8.5 Landforms and Landscapes

There is a range of landscape types within the resorts area which are easily recognisable by visitors and defined by topography and vegetation community. The alpine and sub alpine scenery is a distinctive and important part of the experience for visitors to the Park.

There is a need to understand topography, aspect, surficial geology and vegetation community with site specific features. This synthesis is the process required to derive landscape units. The understanding of the landscape units is essential to define and evaluate the scenic values associated with the landscape, and the management of the places.

8.5.1 Relationship of Built Environment to Adjoining (un-built upon) Lands

The relationship between landscape and buildings is one of the defining characteristics of the accommodation precincts within the Perisher Range Resorts. This characteristic is highly valued by 'users' of the area and all documents reviewed concurred that an objective should be to retain the 'bushland' setting for these existing areas.

The spatial separation between buildings and the height of buildings in relation to the height of the surrounding trees currently determines the impact of the buildings within the overall landscape. Where there is no vegetation surrounding the building, or where the spaces between buildings is close, the visual impact of the building is greater. In the existing

accommodation areas an increase in height or density can be avoided though control of building applications.

8.6 Character of Built Environment

8.6.1 Architecture

The built environment of the resort villages, while generally consistent in scale is not one of a uniformly distinctive or dominant architectural style. There is quite a diversity of materials, styles and colours, with some buildings designed to be camouflaged and others intended to be more visually prominent.

The harmonising of the smaller scale lodges in all resort areas is achieved through their being widely spaced apart in typically well treed areas, so that the canopies obscure a full view of the building.

The small accommodation buildings generally use non-reflective materials and colours that blend with the setting and appropriate mass and form, thus ensuring sympathetic solutions in most cases. The application of the building materials guideline, determined by the early Building Code, has succeeded in minimising visual discord and providing opportunities for innovative architecture in the smaller residential buildings of the study area.

The larger Perisher Valley and Smiggin Holes buildings are highly dominant in their settings without the visual 'softening' of vegetation, compounded by their (necessary) placement beside large areas of pavements. The visual prominence of the pavement is exacerbated by it being black asphalt. These buildings are more idiosyncratic in architectural form and accent colour is used for impact. As a result, visual harmony is not achieved in the Perisher Valley or Smiggin Holes central facilities areas.

8.6.2 Urban Form

The following outline summarises the key urban form issues for each village area.

Smiggin Holes Resort

The small scale and simple layout of the Smiggin Holes resort is not overpowering in size or intimidating in complexity, with the majority of the focus on the central facilities area and car park. This smaller resort quality of urban form is desirable to retain, if only to provide diversity of experience within the greater resort complex. The poor visual quality of the approach and arrival into Smiggin Holes from the Kosciuszko Road is probably the greatest urban design challenge.

The urban design challenge for re-development of the Smiggin Holes resort area is generated by three existing features:

- Broadacre use of asphalt paving for day parking at grade.
- The 'gateway' to the resort being the exposed 'industrial' style machinery workshops in an expanse of asphalt that extends from the roadway.
- The 'entry' vista first encountered is the back end of parked buses.

The placement of the accommodation buildings well spaced among trees is a feature of this resort area and one which should be retained. The gateway experience needs to be improved.

Guthega Resort

Guthega is a modest collection of buildings on the steeply sided western facing range. The land available for additional building, while retaining an envelope of green around all buildings, is very limited. Being small and linear, this resort area does not have strong cohesive urban form. It is expected that new developments will be limited and consistent with the existing built form.

Blue Cow

As a single, isolated building within the ski fields it does not qualify as a resort village. However, there are a number of design issues relevant to its setting.

Being an isolated monolithic building, it is visually imposing on the flat ridge top location. The siting of the building off the spur and onto the western side is highly desirable, as it limits the visual impact, not impinging on Perisher Valley itself. Any potential for expansion should be limited to sites and designs where the impression of building mass is lessened, and no other visual catchments are affected and all colours are designed to minimise visual impact.

As there is no anticipated change to the Blue Cow station / building precinct, the urban design issues for this area are not discussed further.

Perisher Valley Resort

The areas for accommodation are known as North Perisher, Marritz Precinct and South (Eiger) Perisher, with the existing facilities buildings being in Centre Valley. Each of these different areas have different spatial qualities and distinctive characteristics. The retention of this individualism is desirable as it is considered part of the heritage of the place.

The urban design challenge for the accommodation areas is quite different to the Centre Valley and adjacent areas. The issues to be addressed in the accommodation areas are:

- Adequate parking spaces.
- Surface materials for roads, driveways and parking areas.
- Minimal concentrations of stormwater.
- Sufficient separation of buildings to retain stands of trees and provide each building with an envelope of green.
- A palette of materials and colours, building form and massing so that it is 'touching lightly' on the landscape.

The urban design of the Centre Valley is the subject of further study. However, the broadacre use of asphalt paving for day parking at grade is one of the most visually intrusive features of the existing resort.

8.6.3 Resort Facilities

The location of the accommodation in the various village areas of the Perisher Range Resort is predominantly on the shoulders of valleys at lower altitudes. Retention of the valley floor clear of buildings makes sense for reasons of flooding, foundation conditions and cold air drainage.

Perisher Valley village is dominated by a large carpark. The facilities beside the carpark house most of the public facilities, with expanses of glass orientated to take advantage of north / western sunshine, as well as views out over the ski slopes. Smiggin Holes is a gentle basin with accommodation arranged around the central car park and resort facilities. The Guthega village area is the smallest of all the resorts. The few accommodation places and the multi purpose

facility building face west on the upper mid slopes of the steeply sided hill. Blue Cow is both a ski field area and a large facility building.

8.7 Scenic Values, Landscape Characteristics and Visual Context

The scenic values of any place are intrinsically linked to the heritage of the place. The resort areas are cultural landscapes and have different scenic values to the wilderness areas with natural heritage dominated scenic values. The document 'Perisher Valley: A Landscape Strategy provides a method of determining scenic values (Jackson Teece Chesterman Willis 2000). This is a reasonable basis for continuation of this process with the added understanding of the heritage overlay.

The visual context in which the landscape (thus the scenic value) is viewed, determines the relative importance of the scenic values to each place. For example, the Perisher Valley village being highly visible from many view points and by many different 'viewer' groups has the most critical visual context. Conversely, the village area of Guthega is difficult to view as one entity, by any viewer group and from any view point and therefore the visual cohesion and the scenic value of the whole place is less critical.

Further work on the scenic values of the Perisher Range Resorts should factor in visual context and heritage significance.

8.8 Further Work

Further work is required in the following areas:

- Definition of landscape units across all resort village areas, with critical components / values identified, to better aid the landscape management.
- Visual assessment of resort village areas, scenic values and key view points are to be identified, to provide sufficient information to develop urban design guidelines for the villages, as well as development controls for the ski fields and major infrastructure such as roads.

8.9 Implications for Ski Resort Development

The following are the planning implications in relation to urban design derived from the reviewed reports for the whole study area and in particular the resort areas:

- The various village areas should retain their individuality and their 'bushland' setting with widely separated buildings and building height below the tree height for individual accommodation buildings.
- Re-development of the Perisher Centre Valley area is to have new buildings grouped to form a new "village" that lessens the visually discordant impact of the existing carpark and the disjointed facilities buildings.
- Scenic values for each of the different landscape units and the important view points are to be identified to guide management, re development and infrastructure upgrading.
- Building form and style is to be consistent where buildings are placed together, however
 individuality of site response should not be inhibited within the constraints of height, materials and
 colour palette.
- Colours and material palettes for all surfaces and finishes to be determined and may vary for each village area with the aim for the buildings to be visually 'touching the landscape lightly'.

This section provides a review of social and community services available within the resorts area based on available existing information, and analyses the adequacy of these services in the context of likely resort development plans.

9.1 Existing Social/Community Infrastructure

9.1.1 Accommodation

The Perisher Range Resorts currently have a total of 3,577 allocated beds. These are in the form of hotels, commercial lodges, ski club lodges, apartments and staff lodges. This contrasts with the approved bed capacity for the resorts described previously in Sections 2.1 and 2.8. The beds are distributed as shown in Table 9.1 below.

Resort Area	Bed Numbers		
RESULTATEd	Current	Approved Maximum	
Perisher Valley	2,450	-	
Smiggins Holes	866	-	
Total Perisher Valley/Smiggins Holes	3,316	4,368	
Blue Cow	25	25	
Guthega	236	330	
Additional Allocation (to be determined)	-	174	
TOTAL	3,577	4,897	

Table 9.1 Existing and Approved Bed Numbers

Outside the village areas, three commercial lodges provide overnight accommodation (a total of 511 beds) for visitors to the resorts. These are Sawpit Cabins, Sponars Chalet and Ski Rider Hotel. Thredbo, with 4,810 beds, presently has more accommodation than the total Perisher Range villages.

Off-mountain accommodation is available at Jindabyne, Berridale and Cooma. Jindabyne is the main centre and has a diverse range of recreational, tourist, community, education, commercial, industrial and infrastructure facilities to support its permanent (approximately 2,000) and visitor population (approximately 6,000) (Snowy River Shire 1999).

9.2 Public Facilities

The Kosciuszko National Park Base Area Study conducted in 1990 (Ecosign) provides a detailed floorspace inventory of base facilities at the Kosciuszko resorts. This data was updated for the Perisher Range Resorts (where appropriate) in the Master Plan EIS. The key findings are reproduced below.

9.2.1 Perisher Valley

Ecosign (1990) commented that Perisher Valley had space shortages in about one-half of the 15 resort visitor service facilities, with apparent shortages in kitchen and food preparation areas, first aid/ski patrol, ski school, public lockers, administration, lift ticket sales and bars/lounges.

Ecosign commented that "several of these service functions are major revenue generators and it is likely that revenues are being limited by the lack of these facilities". Changes more recently (for instance, JAX nightclub, the administration office in Perisher Centre and the Creche) have reduced the space shortages somewhat. Design Workshop (1996) estimated that there was an existing deficiency of approximately 4,000m² to 5,000m² of commercial floor area at Perisher Valley.

9.2.2 Smiggin Holes

The main facilities are the Smiggins Hotel, 7 commercial lodges, 14 ski club lodges and 5 staff lodges. Based on Ecosign's analysis, Smiggin Holes had major space shortages in food service seating, kitchen and food preparation areas, first aid and ski patrol, ski school, public lockers, administration, lift ticket sales, employee lockers, nursery/daycare and storage/mechanical.

9.2.3 Guthega

Guthega has one commercial lodge and 9 ski club lodges. Four buildings – Guthega Ski Centre, Snowed Inn II Kiosk, Guthega Workshop and Guthega Lodge Restaurant - provide 99% of all public floorspace. The Ecosign (1990) report identified shortages in first aid/ski patrol, ski school, ski rental/repair, administration, bar lounge and nursery/day care.

9.3 Community Services

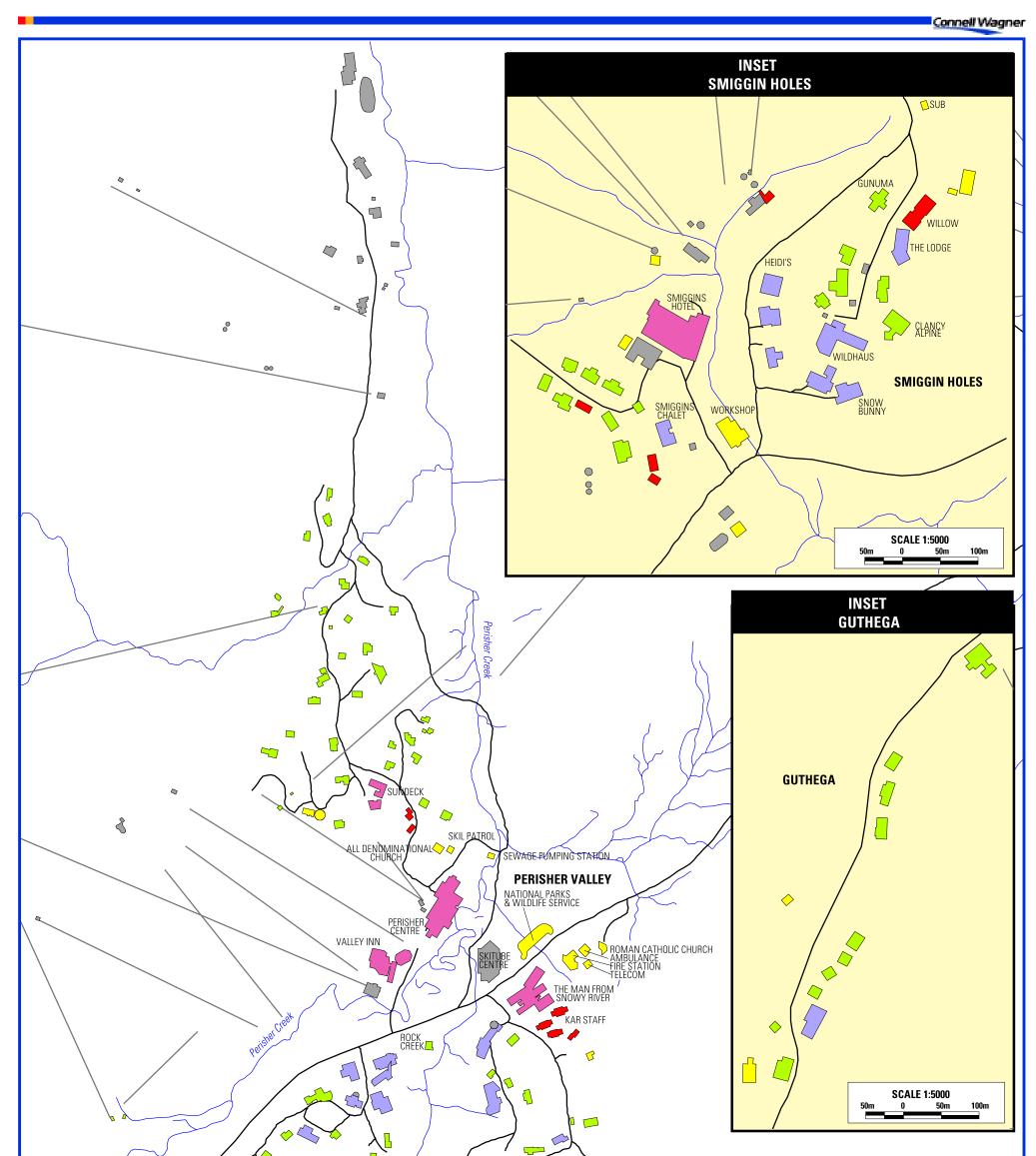
Community services in the Perisher Range Resorts are concentrated at Perisher Valley as follows:

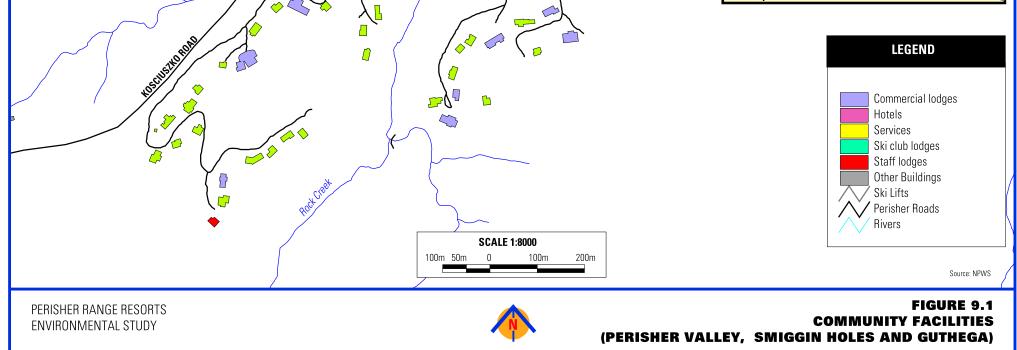
- Alpine Church
- NPWS Information Centre
- Catholic Church

9.4 Emergency Services

The following emergency services are found in the Perisher Range Resort area:

- NSW Police Service: Four officers currently work out of Perisher Valley Station during the winter. The Cooma Patrol Commander indicated in 1997 that two additional officers may be acquired for the winter in the course of the next five years (Kinhill 1997).
- Ambulance Service: The NSW Ambulance Service operates a 24 hour service to all resorts from its Perisher Valley branch base from the long weekend in June until the end of the school holidays in October. At other times of the year, ambulance services to the area are provided from Jindabyne Ambulance Station. The Ambulance Service also coordinates a helicopter/Medivac service to Perisher village on an as-needs basis although the lack of a dedicated helipad makes evacuations difficult.
- Fire Brigades: Region South of the NSW Fire Brigades has a modern Fire Station in the Perisher Valley village equipped with both four wheel drive and tractor type vehicles capable of providing emergency response during both winter and summer months.
- State Emergency Service: The SES is mostly a voluntary operation based in Jindabyne. In 1997 its current workload did not exceed its capacity in most situations unless a major emergency arose when it would call in help from other units.
- Perisher Medical Centre: Located in the Ski Centre, the Perisher Medical Centre provides the services of a medical practitioner 24 hours a day throughout the ski season. During normal working hours, a receptionist and nurse are also on duty and additional medical staff are available if required.





• Ski patrols: Both professional and volunteer ski patrols operate within Perisher Valley and run routine patrols for hazards as well as responding to accidents on the ski slopes and ski fields.

9.5 Existing Services Outside Resort Area

As the closest centre to the Park, Jindabyne is heavily dependent upon the tourism and skiing generated within the resorts area. The Col found that this situation was unlikely to change in the foreseeable future.

The following information on community and social services in Jindabyne is taken from the *Snowy River Shire Community Profile* (1999).

Jindabyne is the largest town in the Shire and the major focus of development in the region. It is also the main service centre for the tourist industry in the Park. The majority of skiers and summer visitors to the resorts area stay in Jindabyne and travel to the mountains each day. The population of the main township itself is 1,650 with a total population of 2,400 in urban areas that include serviced rural residential estates and lakeside villages.

9.5.1 Housing

Housing is a major issue in Jindabyne with a large number of unit/multi-dwelling/lodge style of dwellings compared with single dwellings. Many dwellings are unoccupied outside the tourist season and contribute to a "run-down" appearance of many streets. Combined with the relatively high cost of housing, this perceived poor amenity has resulted in residents relocating to another centre such as Berridale or purchasing a rural residential estate. There is a high demand for this type of accommodation and a shortage of secure, affordable long term rental accommodation. There is no public housing available in Jindabyne. The net result of these housing trends is that only a minority of permanent residents live in rented accommodation.

9.5.2 Education, Facilities and Services

Facilities in Jindabyne reflect the nature of the town as a tourist destination with a heated swimming pool, 4 squash courts and a large number of restaurants. In addition, there is a bowling and sports club with tennis courts, a community hall, a lakeside cycleway and a skateboard ramp.

Community facilities developed in the last 4 years include a community health centre, a childcare centre and a private school (combined primary and high school). The NPWS has its regional headquarters and Information Centre in Jindabyne and a branch office of Snowy River Council was opened in 1998.

Services include a full Australia Post Shop, police, fire and ambulance stations, 2 banks, 2 medical practices (1 with visiting specialist services), physiotherapist, 2 dentists, veterinarian surgeon, visiting services from optometrist and chiropractor, an accountant and 2 travel agencies.

Other facilities include Lake Jindabyne Sport and Recreation Centre, which offers many of its facilities to the local community. Planning is underway for a joint private Department of Sport and Recreation Golf course/resort development as well as moves towards making the centre a Regional Centre of Sporting Excellence. A TAFE learning centre has recently been established at the centre and offers a range of computer, business studies, child care and disability services courses. Two caravan parks are located beside the lake with one of these linked with a service station, restaurant, café and outdoor sports shop.

9.5.3 Business Services

There are two main retail areas in the town more or less linked to form a CBD by the NPWS building. Businesses include a supermarket, 2 chemists, a bakery/teahouse, restaurants, real estate offices, solicitors, outdoor sports stores, clothing stores, an internet café, hairdressers, a computer support store, a florist/haberdashery outlet, accommodation booking services, numerous ski equipment outlets, employment agency, butchery, newsagency and sub-agency, dry-cleaning business, 2 service stations, 2 hotels, graphic design and printing establishments, and a motel.

9.6 Snowy River Shire Social Plan

The Snowy River Shire Council has recently released the *Snowy River Shire Social Plan 1999/2000* (Snowy River Shire 1999) which is underpinned by the *Snowy River Shire Council Community Profile* (1999). The Community Profile emphasises the difficulties in obtaining accurate statistics and demographic data for the Shire since the Census count is undertaken during the ski season when visitor levels are extremely high. Hence, figures for "usual resident population" in the Profile rely on a combination of 1996 Census usual resident data, ABS 1998 Estimated Resident Population data, bush fire brigade data and local estimates. The Community Profile estimates the usual resident population for Perisher Valley as 30.

The Social Plan has reiterated many of the issues identified in the *Draft Alpine Region Strategy*, with particular emphasis on the perceived social and economic disbenefits resulting from the role of tourism as the main economic base of the local government area.

Since Jindabyne bears the brunt of these effects, the following social effects are identified in the Social Plan:

- Access and affordability problems with child care and family life caused by seasonal work and long/irregular hours with a perceived high rate of marriage breakdowns
- Heavy seasonal demand on services and facilities such as medical and child care services and associated off-season viability problems
- Shortage of affordable housing
- Disruption and strain on local school resources from the increased winter resident population, with impacts on the quality of education to permanent pupils.
- Documented increase in vandalism and petty crime with associated drug problems
- The problem of "staff ghettoes" due to the limitations on permanent resident accommodation within the Park.

A community development leadership group known as Partnership Jindabyne has been formed from collaboration of Council, the Jindabyne Chamber of Commerce and the Department of Regional Development with the aim of encouraging the development of non-tourism related industries to diversify the economic base of the area.

Other recommendations of the Social Plan applicable to Jindabyne are:

- Provide an Internet Access Point to allow free access for information and research purposes.
- Expand health services offered through the Community Health Centre.
- Research potential for location of branch of Monaro Regional Library.
- Provide support and information to local High School Steering Committee.
- Support Jindabyne Development Committee with its plans for an art gallery and cultural centre.

- Facilitate the establishment of a Snowy River Arts Council and participation in the Southern Tablelands Regional Arts Council.
- Develop a strategy for the coordinated production and dissemination of information regarding Council and its activities.

9.7 Adequacy of Services

9.7.1 Findings of Commission of Inquiry

The economic assessment presented to the Col concluded that the proposed development was unlikely to have an adverse impact on the availability of regional welfare and community services. The Commission findings concurred with this conclusion, stating:

"The effect of the Commission recommended "activity" on regional services, schools, health services and housing will be minimal and unlikely to overstress existing community services".

The Col predicted a decline in market share for the Park tourism base unless increased onsnow accommodation was provided and the built environment and infrastructure of the Perisher Range Resorts improved and developed as year round resorts. Development of the village centre according to the amended proposal and redressing environmental problems was recommended as a short term solution which would not unduly impact on the social and economic viability of towns in the Alpine region.

These findings were qualified, however, the Col emphasised the need for a long term strategic approach to planning of the Perisher Range Resorts and a detailed examination of a regional planning strategy in respect of Kosciuszko National Park and, in particular, Jindabyne. At the time of the Col, preparation of the Draft Alpine Region Strategy (DUAP 1998) was already underway. This strategy developed 28 policies and with action plans, priorities and responsibilities allocated to each policy. One of the key policy initiatives recommended for early implementation was for DUAP and NPWS jointly to prepare a Jindabyne and Kosciuszko National Park Settlement Strategy.

Of particular relevance to the development of Perisher Valley and Smiggin Holes is the proposed extent of commercial floor space of 6,000m². The Col found that the need for this floor space has not been justified and that it is likely to have an adverse impact on existing traders both within the Park and Jindabyne. The Col recommended that the amount of commercial floor space required for retail use as opposed to that necessary for recreational and entertainment purposes be established. In its amended proposal, the NPWS stated that the retail and commercial space would be significantly reduced from below the level proposed in the Master Plan EIS. However, it is not apparent whether any further studies have been carried out to establish and justify a revised floor space allowance. The Col identified the need to distinguish between floor space required for village centre recreational and entertainment facilities as opposed to that for the sustenance of on-snow accommodation occupants and day visitors.

9.7.2 Conditions of Approval

In the report to the Minister, the Col considered that no useful purpose would be served in recommending detailed conditions of consent since amended plans had to be submitted prior to approval. In NPWS's report to the Minister incorporating the amended proposal, one of the recommended conditions of approval (condition 4) required that a revised Master Plan/Ski Resort Development Plan be prepared. The recommended condition stated that the revised

plan should incorporate consideration of options relevant to maximum visitation consistent with a number of factors including:

- environmental constraints
- regional considerations relevant to on-snow accommodation
- tourism objectives

The recommendation further stated that the preparation of this plan would be preceded by research and monitoring. In the light of the Col findings and recommendations, socio-economic considerations need to be factored in as an environmental consideration and balanced with other environmental issues. Hence the requirement to research all available socio-economic data and identify where additional studies may be required.

9.8 Implications for Ski Resort Development

Planning implications arising from the review of social and community services within the resort area have been identified as follows:

- There is an urgent need for DUAP and NPWS to progress preparation of the Jindabyne and Kosciuszko National Park Settlement Strategy.
- Jindabyne should continue to be the main provider of regional and tourist services, in particular schools, child care, health services and accommodation.
- Further studies are needed to identify the floor space requirements for recreational and entertainment services in the resorts with respect to both summer and winter visitation.
- Need for provision of year round tourist facilities at Perisher Valley.

10.1 Existing Road and Rail Infrastructure

Visitors can access the resorts area via either Kosciuszko Road or the Alpine Way. Kosciuszko Road provides direct access to Perisher Valley and Smiggin Holes, while the Alpine Way provides access to parking at Bullock's Flat and transfer to the Skitube. Bullock's Flat provides parking for both day and overnight visitors, while parking facilities accessible from Kosciuszko Road are generally restricted to day visitors, with the exception of small overnight parking areas at Sawpit Creek and Guthega. Current peak visitation to the resorts area is in the order of 17000 persons per day, with 3500 based in the on-snow accommodation, 8500 accessing via Kosciuszko Road and 5000 via the Alpine Way and Skitube. Future projections anticipate visitation growing to 22000 per day, with 4500 based in the on-snow accommodation, 8500 still accessing via Kosciuszko Road and 9000 accessing via the Skitube and the Alpine Way.

Kosciuszko Road has a theoretical design capacity of 1150 vehs/hr. However, this figure is considered to be unrealistically high due to the general terrain and road alignment. Road capacity thresholds of 900 vehs/hr in good weather conditions and 500 vehs/hr in poor weather conditions (when vehicles must be fitted with chains to facilitate passage) are considered more appropriate. With car occupancy at about 3.3, this equates to approximately 2500 vehicles accessing the resorts area via Kosciuszko Road on a peak day. Assuming a 2.5 to 3 hour arrival period (between 7.30-8.00am and 10.00am) it is evident that current arrival rates match the capacity of the road. Similarly, car parking entry rates of 650/hr at Perisher Valley and 25/hr at Smiggin Holes correspond with the road capacity and visitation levels.

Visitors accessing the resorts area via the Skitube initially travel via the Alpine Way to Bullocks Flat. With car occupancy at about 2.7, and assuming the 2.5 to 3 hour arrival period, this equates to around 700 vehs/hr arriving at Bullocks Flat, which is confirmed by the levels of parked vehicles (i.e upto 2000). Under average conditions, about 400 vehs/hr continue on the Alpine Way to Thredbo. Hence, the Alpine Way is currently operating near its design capacity of about 1200 vehs/hr.

(Source: Kinnii 1996)				
Element	Theoretical Design Capacity	Measured Peak Flows	Constraints	Constraint Flows
Alpine Way	1288 vph	1170 vph	Entry to Skitube Mix of Vehicles Intersection with Kosciuszko Road	approx. 900 vph approx. 700 vph (design) approx. 1170 vph (actual)
Kosciuszko Road	1106 vph	approx. 800 vph	Perisher Carpark Entrance Station Chain Bays Mix of Vehicles Weather conditions	700 vph approx. 800 vph 400 vph
Alpine Way / Kosciuszko Road Intersection	700 vph (absorption) 1106 vph	Kosciuszko Road 800 vph Alpine Way 1170 vph	Kosciuszko Road and Barry Way and Kalkite Street intersections	1176 vph
Guthega Road	Approx. 500 vph	Not Available	Unsealed, narrow pavement, snow, parked vehicles.	

Table 10.1 Summary of Existing Road Access (Source: Kinhill 1996)

10.2 Visitor Access under Various Conditions

During the winter months, both the Alpine Way and Kosciuszko Road can be affected by adverse weather (snow, ice etc). For Kosciuszko Road, adverse weather conditions can occur up to 4 days a week during this period, generally requiring the fitting of chains which can slow traffic significantly. The adverse weather conditions along Kosciuszko Road impact on arrival patterns. If the weather is good then less people tend to use the Skitube and more commute via Kosciuszko Road. Conversely, if the weather conditions are poor, more visitors utilise the Skitube. The Alpine Way is already close to capacity under good weather conditions and at capacity during poor weather conditions. During peak times and poor weather conditions, delays occur at the Skitube entrance in the AM peak and at the intersection of Alpine Way and Kosciuszko Road in the PM peak.

Table 10.2 below summarises the options available for gaining access to the resorts area during the winter season.

Access Option	Parking Provisions	
Via Alpine Way and Bullock's Flat		
Car + Skitube	Day and Overnight Parking	
Private Coach + Skitube	Day and Overnight Parking	
Commercial Coach + Skitube	Drop-off	
Taxis, shuttle bus etc + Skitube	Drop-off	
Via Kosciuszko Road		
Car	Day Parking (Perisher, Smiggin Holes & Guthega) Overnight Parking (Sawpit Creek & Guthega)	
Private Coach	Day Parking (Smiggin Holes)	
Car + hotel/lodge shuttle bus	Overnight Parking at outside resorts (Sponars Chalet, Ski Rider), drive or shuttle bus to Perisher	

Table 10.2 Modes of Winter Season Transport (Source: Kinhill 1996)

During the summer season, all means of access to Perisher Valley are available (except for some of the shuttle bus services). The Skitube operates on a reduced schedule during the summer months. Overnight parking is allowed at all the Perisher Range Resorts in the summer, eliminating the need for Sawpit Creek overnight parking.

The Guthega area is serviced by two roads, the main route from Kosciuszko Road (which also serves the power station) and the other between Smiggin Holes and Guthega (the link road). During the winter months, the link road is closed and all traffic must use the power station road. This road is used for road side day and long stay parking which severely restricts its use by through traffic.

10.3 Car / Coach Parking

There are ten defined carpark areas that service the Perisher Range Resorts. These parking areas are located at Bullocks Flat, Perisher Valley, Smiggin Holes, Guthega and Sawpit Creek (refer Table 10.3).

Location	Design Capacity	Peak Count	Constraints	Constraint Flows
Bullocks Flat A	1426	1334	Entry / exit off Alpine Way	700 vph
Bullocks Flat B	782	643	Entry / exit off Alpine Way	700 vph
Bullocks Flat C	822	1003	Entry / exit off Alpine Way	700 vph
Bullocks Flat Coaches	200	36	Entry / exit off Alpine Way	700 vph
Perisher Valley	1633	1376	Entry / exit off Kosciuszko Road	700 vph
Smiggin Holes Car	526	625	-	-
Smiggin Holes Coaches	64	46	-	-
Sawpit Creek	130	130 estimate	Transport to skifields, security	-
Guthega Day	60	Not Available	Access, steep slopes	-
Guthega Overnight	50	Not Available	Access, steep slopes	-

Table 10.3 Summary of Existing Parking (Source: Kinhill 1996)

A notable feature from the above parking figures is the apparent substantial oversupply of spaces for buses / coaches at Bullocks Flat. Peak demand / use should be surveyed during winter 2000 to confirm forward requirements and this is expected to yield space that could be converted to additional car parking capacity. If this eventuates, the demand for extra car park area would be deferred.

The village development proposed in the Master Plan EIS (Kinhill 1997) anticipated a reduction in car parking at Perisher Valley by around 560 spaces. However, the Col found that the proposal was unacceptable from a parking capacity viewpoint and stated that it was imperative that the overall level of parking in the resorts area be maintained. It was further stated that the exact disposition of parking between the different resort areas could be changed (eg additional parking at Smiggin Holes could be proposed to off-set any reduction at Perisher Valley). The Col further recommended that the opportunity for a multi-deck car park at Perisher Valley be examined. The feasibility of such a concept is expected to be established in the private sector submissions for development of a new village.

10.4 Future Transportation Strategy

As noted above, growth in visitation to the Perisher Range Resorts will almost certainly be dependent on the ability to increase the number of people using the Skitube. Advice from the operator is that train frequency can be improved through additional rolling stock expenditure and related operational changes. However, the road capacity for access to Bullocks Flat is likely to be a key constraint, with peak visitation days in poor weather already at capacity (both at the Skitube entry and the Alpine Way / Kosciuszko Road intersection).

This road capacity situation has the potential to seriously constrain realisation of the projected visitation to, and development of, the Perisher Range Resorts and accordingly, a transport / traffic study is required to determine the best strategic direction. The study should confirm road / parking

capacity and predicted demand and examine feasible and sustainable transport options. This must include some focus on alternatives for access between Jindabyne and Bullocks Flat including bus transit and also extension of the Skitube.

10.5 Implications for Ski Resort Development

The following implications can be drawn from the results of the traffic and access assessment:

- The balance between road capacity and parking at Perisher Valley and Smiggin Holes should be maintained and therefore, improvements to Kosciuszko Road should be for maintenance purposes only.
- Develop a strategy which aims to get visitors to either Perisher Valley, Smiggin Holes or Blue Cow and then have a strong/improved ski slope connectivity to enable ready access around the range.
- There is to be no net loss of car parking spaces in the resorts area. Any loss of parking at Perisher Valley (for village development) is to be offset by similar capacity elsewhere (ie Smiggin Holes).
- Additional study required of peak parking areas use at Bullocks Flat to determine if space can be reallocated from buses to vehicles.
- The Skitube is to handle the extra transport demand to the resorts area, with no upgrading of Kosciuszko Road other than for safety improvement.
- Need to consider overnight parking in resorts area and the effect on day use area available.

11.1 Alpine Skiing

Perisher Blue P/L recently prepared a Ski Slope Plan (2000) with respect to the provision and management of facilities of the ski slopes for the foreseeable future. The document included a diagram indicating the historical development of the resort since the 1950's (refer Figure 11.1). The Perisher Range Resorts area is the largest ski area in Australia with an area of 1250 hectares and 50 operating lifts capable of providing for more than 10,000 skiers at one time (SAOT). At the time of preparing the report it was estimated that approximately 82-87% of ski slope use was by alpine skiers with 13-18% of use by snowboarders. Current usage by snowboarders is expected to be higher. However, for the purpose of ski slope use and analysis, no distinction is made between skiers and snowboarders.

For planning purposes, the report has defined a "design day" as the tenth busiest day of a season. In 1996 the design day was estimated to accommodate 9600 skiers on the slopes with the peak day estimated at 25% more skiers (ie approximately 12,000). Proposals for improving ski accessibility between the resorts comprising the Perisher Range Resorts and other ski slope improvements provide for a design day capacity of about 15500 skiers. At a growth rate of 2.0% per annum it is estimated the design day will be reached by the year 2020.

The Ski Slope Plan (Perisher Blue P/L 2000) reviews the current operation of the resort and divides the area into twelve precincts. Each precinct plan identifies the location of ski infrastructure and the principal environmental characteristics. The planning goals in the Plan are intended to reflect both operational and environmental considerations, as follows:

- Integration Integration of the four previous resorts.
- Modernisation Replacement of outdated lifts and equipment and upgrading to meet current expectations for safety and convenience.
- Expansion Provision of additional lifts, trails and other facilities to make efficient use of the areas identified in the POM for alpine skiing.
- Enhancement of the Visitor Experience Creating a safe and attractive environment for all seasons.
- Environmental Sustainability Implementation of skiing improvements in a way which maintains or enhances the essential natural processes in the environment of the resort.

The existing lift capacity for each precinct is identified in Table 11.1 (overleaf).

Precinct	No. of Lifts	SAOT
Perisher Valley	13	1253
Back Perisher	4	1479
Mount Perisher	5	1353
North Perisher	2	785
Smiggin Holes	11	1171
Mount Piper South	1	150
Pleasant Valley	7	1876
Blue Cow Mountain	2	1268
Guthega	5	711
TOTAL	50	10046

The Ski Slope Plan contains a large number of proposals for lift replacement, new lifts, expanded areas for snow making, improved skier circulation, the location of ski school activities, mountain restaurants, ski racing facilities, mountain workshops and summer access and trails. A review of the proposed improvements will be undertaken following completion of the Environmental Study to ensure that such proposals are capable of being undertaken in an environmentally sensitive manner having regard to the findings of the Study. The final plans, amended as necessary, will be included as part of the Ski Resort Development Plan process.

11.2 Cross-country Skiing

A Perisher Range Cross-country Ski Development Plan has been prepared by NPWS for the period 1999-2003 following consideration of submissions lodged at the time of exhibition of the draft plan in 1997. The Plan recognises the Perisher Range as the most important cross-country ski area for day touring and track skiing in the Park and one of the most popular cross-country ski destinations in Australia. For cross-country skiing, the Perisher Range area extends from Charlottes Pass in the west to Dainers Gap in the east.

The cross-country trail network is to be managed using a concept of activity zones to reflect the types of skiing experiences proposed for each zone. The principal functions of each of the zones are described as follows:

- Zone 1 Reception / Facilities Zone. This zone is intended to provide services, information and initial contact for skiers located at the trail head.
- Zone 2 Concentrated Skiing Zone. This zone contains the most concentrated area of ski trails, including the 2.5km and 5km trails, which carry the main racing tracks.
- Zone 3 Moderate Use Zone. This zone includes the less heavily used trails such as the 7.5km and 10km trails, the Smiggin Holes loops and other longer distance trails.
- Zone 4 Dispersed Skiing. The remainder of the Perisher Range trail network will be managed for dispersed cross-country skiing, catering mainly to more experienced recreational skiers and tourers undertaking longer day trips from the resorts.

The Perisher Range currently contains 20 marked trails, of which one is for disabled skiers, 16 are for intermediate skiers and three for advanced skiers. The plan proposes to develop five new trails of which three would be for intermediate skiers and two for advanced skiers. An improved link to Porcupine Rocks from the Saddle is also proposed.

The Cross-country Ski Development Plan supports the establishment of a new Cross-country Ski Centre in Perisher Valley to provide a public "face" for cross-country skiing, subject to completion of a detailed feasibility study. A smaller public shelter is also proposed for Smiggin Holes.

11.3 Implications for Ski Resort Development

Planning implications arising from the review of ski infrastructure facilities within the resorts area have been identified as follows:

- Evaluation of the ski infrastructure proposals contained in the Ski Slope Plan should be conducted and evaluated against the findings of this Study has been finalised and then incorporated, as appropriate, in the SRDP.
- Based on the findings summarised in Section 5 (Natural Environment), consideration of additional
 infrastructure for alpine skiing in new areas should be closely scrutinised in accordance with the
 principles of ESD. In particular, the ecological integrity of areas outside and adjoining the existing
 alpine ski fields should not be compromised.
- Consistent with the transport issues and strategies identified in Section 10, there needs to be an objective to improve the integration/connection of the different ski slope areas within the Perisher Range Resorts.
- As with other development and infrastructure in the resorts area, the proposed EMS should contain measurable performance criteria and focused monitoring programs that demonstrate the environmental impacts of ski slope development and use and the effectiveness of related management actions.
- The location/capacity of slope lifting facilities needs to be integrated with the access and parking facilities.
- Planning should provide for the integration of cross-country skiing, alpine skiing and the village centre.

The following section contains a summary of all of the planning implications from the preceding sections of this report. In addition, this section contains two figures which are designed to illustrate those areas within the Perisher Range Resorts which should be regarded as having the highest conservation priority. Figure 12.1(a) identifies those areas which have the highest conservation value, including known Mountain Pygmy-possum habitat and travel corridors; known and potential habitat of the Southern Corroboree Frog; vegetation communities of National Significance and which are very restricted in their occurrence; and geological features of State Significance. Figure 12.1(b) shows the area occupied by vegetation communities considered to be of National Significance, including Upland and Valley Bog; Block-Stream Heath; Rocky Snowpatch Herbfield and Short Alpine Herbfield.

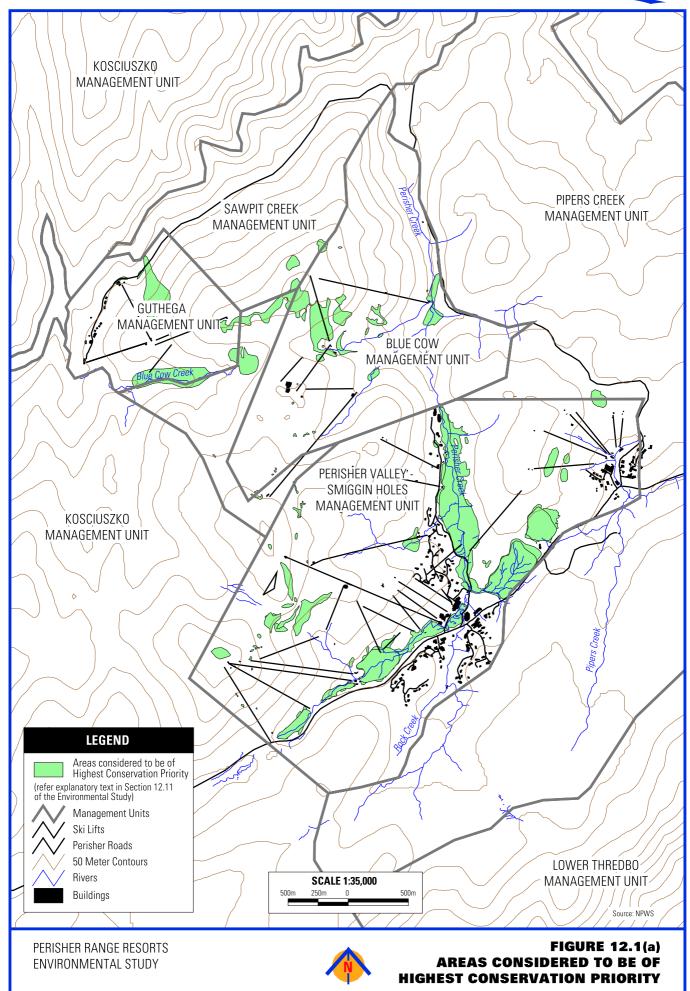
12.1 Regional Context

- All planning must stress the need for protection of the internationally important environmental values of the Australian Alps National Parks.
- Any development of the resorts area must acknowledge the international conservation significance of these features and plan accordingly.
- Development planning for the resorts area must be built upon the principles of Ecologically Sustainable Development.
- A formal environmental management system is required in order to monitor the changes associated with future land use and development in the resorts area and to confirm the level of development that is ecologically sustainable.
- Development planning for the resorts area needs to ensure they enhance the economy and growth of nearby centres, particularly Jindabyne. This may include a reduction of the commercial floor space within the resorts area as originally proposed in the Master Plan.
- The Skitube is to handle the extra transport demand to the resorts area, with no upgrading of Kosciuszko Road other than for safety improvement.
- NPWS need to participate in the settlement strategy and other regional and state government planning initiatives in the area.
- There is a need for further scientific research of the impacts of the ski industry to guide future decision making.

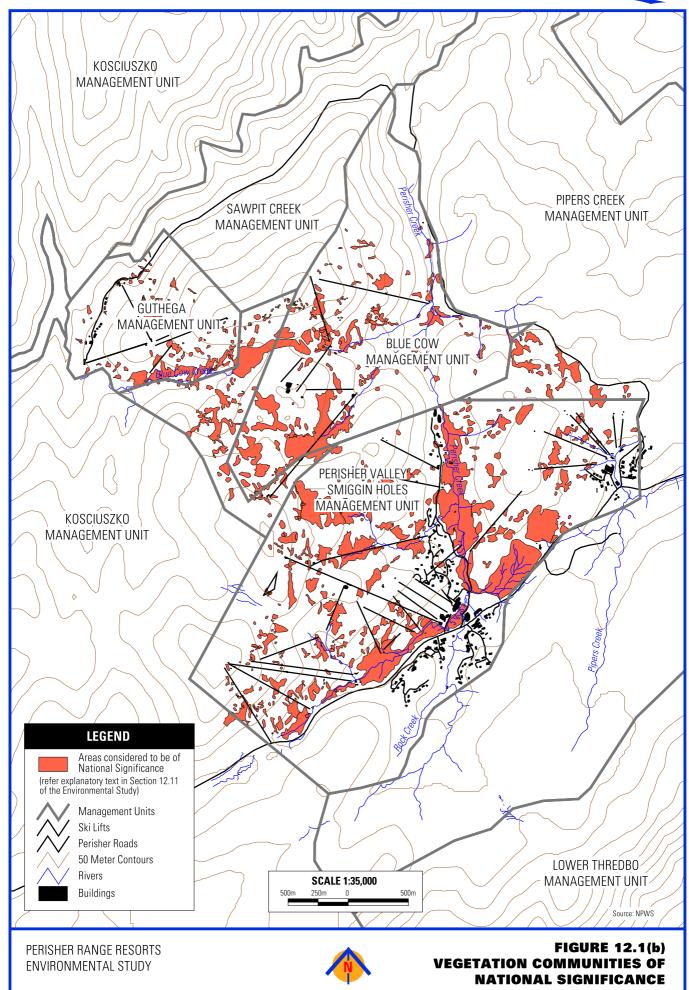
12.2 Role of Perisher Range Resorts

- Ski resorts are an acceptable use in the Park and need not be in conflict with its designation as an international Biosphere Reserve provided relevant environmental features and conditions are appropriately recognised and protected.
- Plans for the development of the resorts area should provide opportunities for enhanced summer use in conjunction with other locations such as Jindabyne and Charlottes Pass. Because of its distinctive setting and attributes, the summer role of the Perisher Range Resorts should contrast to that of Thredbo.
- Any promotion of summer use must be efficiently managed and monitored so as to avoid adverse impact on the environment.
- There is a need for integration of the cross-country skiing area in the southern part of the Park with alpine skiing, facilities and activities.

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12.3 Existing Environmental Performance

- The standard of environmental protection and management in the resorts area has been less than should be expected by the community and any future development plans must not result in further decline.
- Identified environmental remediation and improvement works should be included in a structured and prioritised program and where appropriate, incorporated in new development plans.
- A comprehensive EMS must be prepared by NPWS for the resorts area which will outline goals and strategies for managing environmental risk. All development planning for the resorts must be in accordance with this EMS.
- Planning should assign clear responsibilities for environmental performance to the NPWS, all lessees and other relevant parties. Future developments within the resorts area must be able to demonstrate a net environmental benefit. Where appropriate this may include compensatory measures to mitigate environmental damage.

12.4 Natural Environment

- All development or land use plans must specifically take into account provisions contained within the various Recovery Plans (currently available for Mountain Pygmy-possum, Corroboree Frog, Forest Bats and Alpine Flora).
- Many significant natural features, including geological and vegetation communities, have been identified within the resorts area. Any development or land use plan should protect these features and mitigate any indirect impacts.
- Development within the resorts area must not compromise the survival of any of the threatened flora or fauna species present or likely to occur.
- The aquatic environment of Perisher Creek is already under considerable stress from land use and development in the resorts area (including the STP). Future land use and development plans should actively contribute to improvement in the quality of wetlands and waterways in the study area.
- Development plans should consider entire vegetation communities, not just individual threatened species, which are often significant in their own right. Within the resorts area, vegetation communities of particular significance include bogs, fens and short alpine herbfield.
- Development must be in accordance with the KNP Schedule of Significant Natural Features which specifies in which areas development is not permitted.
- No development should be planned within the 1 in 100 year flood area of Perisher Creek.
- Site investigations are required to assess the risk associated with any proposed land use or development proposal in defined hazard areas (refer Figure 5.9).
- Flood analysis required for Smiggins Creek to confirm suitability of development at Smiggin Holes.

12.5 Heritage and Archaeology

- The surviving archaeological resource within the study area is a culturally significant component of the alpine and sub-alpine Aboriginal cultural landscape. The proven occurrence and distribution of sub-surface artefacts within the alpine and sub-alpine environment provides both a marker of past Aboriginal occupation and an opportunity to study Aboriginal adaptation and exploitation of the high country.
- The conservation of Aboriginal sites within the study area should be a management objective and a planning strategy priority.

- Development within treeless, (frost hollow) valley floor and basal slope contexts are unlikely to impact Aboriginal archaeological sites. Possible (but probably rare) exceptions to this may be artefactual material contained in remnant palaeosols (fossil soils) situated at depth within valley infill sediments, and organic artefacts conserved in wetland and peat bog sediments.
- Development of poorly drained and/or moderate to steeply graded slopes such as would apply for the envisaged Perisher Village concept is unlikely to impact on Aboriginal archaeological sites.
- Disturbance to locally sheltered, relatively level and well drained ground, within elevated grasslands or grassy woodland is likely to impact on Aboriginal archaeological artefacts.
- Development within the zones of archaeological sensitivity must be in accordance with the management strategies outlined in Section 6.2.6 of this report.
- Further work is suggested in the following areas to fill gaps in the data and to assist in the conservation of the place:
- An assessment of the landscape of the place against both NSW and RNE heritage criteria and a determination reached as to the areas of cultural heritage significance, if any, and their level of significance.
- Landscape unit (visual catchment / plant community) identification, and conservation strategies for each village, in particular related to the management objectives of both the Park and the resort operators.
- A visual assessment of the Smiggin Holes and Guthega areas and recommendations regarding the urban design guidelines for conservation and development of this resort, to follow the method established by JTCW.
- A visual assessment and guidelines for the conservation and development of the landscape of the approach by road to the Resort Area, taking account of potential increased recreational visitation in summer and winter.
- The following points summarise the landscape implications and desirable objectives of any changes to the resort areas.
- Individual identity for the Perisher Valley, Smiggin Holes and Guthega resort areas is derived from the landscape, and the pattern of placement, and the scale of the buildings within them. Retention of these distinct and different identities for each resort is desirable.
- The landscapes of the existing resort areas are cultural landscapes of distinction (heritage significance not yet fully assessed), that contribute to the significance of the buildings within their settings. Management of these landscapes should conserve the dominant natural distinguishing features and disallow increase in density of buildings.
- Viewing points into and from the various places within the study area are critical to both the
 appreciation of the place and perceptions of the management, both of the national Park and the
 Resort complexes. Actions should be taken to ensure that key view points are retained for this
 purpose, and that the important qualities of these views from these places are recognised, and
 enhanced not compromised or diminished, by any redevelopment.
- The mode of arrival to the study area determines what is seen and perceived, by workers, visitors and residents. The experiences and sense of arrival is quite different by rail and road, and in Winter and Summer. For travellers by road, the landscape provides the setting for the experience, and builds the sense of anticipation. Deliberate attention to the needs of drivers, for safety and clarity of destination / arrival, plus control and enhancement of the scenic experience, should be given for the entire study area.
- Retention and conservation of the snow gum woodland, and preferably with the native understorey species, throughout the residential precincts and recreational areas. These areas contain both

deliberately and accidentally introduced urban exotic plant species. These require deliberate action in public education and weed eradication programs.

- Remediation of Perisher Creek to provide a dominance of native plants along its banks. This would restore a landscape component previously damaged, and provide a place with appeal and attraction for the Perisher Valley resort.
- In the work by Peter Freeman and team, the recommended policies for the resort areas range from natural resource management issues through to business guidelines. The following points summarise the key recommendations and desired objectives of the range of documents reviewed, that relate to built heritage and are likely to impact on any changes to the resort areas:
- The current pattern of development of the lodges, with the concept of visual seclusion and discrete grouping amongst natural features, should not be compromised by the allocation of new leases to permit infill or provide greater density within the existing resort areas.
- Retention of a mixture of ownership (including private ski clubs) within each resort area to ensure the retention of the historic and social heritage of the pattern of development, and continuity of social mix.
- Conservation and management of the buildings nominated as state or regionally significant in the Freeman study.

12.6 Existing Services Infrastructure

- There is a need for larger focus on co-location (eg telecommunication facilities) and shared facilities/trenches/easements for services to minimise environmental disturbance.
- Need for a strategic plan to address infrastructure needs in the resorts area looking at staged development and the likely ultimate development to cater to the design capacity of 22,000 visitors.
- All services/infrastructure to be closely scrutinised during planning/EIA phase and on a recurrent basis as part of the environmental performance monitoring of the resorts area.

12.7 Resort (Urban) Design

- The various village areas should retain their individuality and their 'bushland' setting with widely separated buildings and building height below the tree height for individual accommodation buildings.
- Re-development of the Perisher Centre Valley area is to have new buildings grouped to form a new "village" that lessens the visually discordant impact of the existing carpark and the disjointed facilities buildings.
- Scenic values for each of the different landscape units and the important view points are to be identified to guide management, re development and infrastructure upgrading.
- Building form and style is to be consistent where buildings are placed together, however individuality of site response is not inhibited within the constraints of height, materials and colour palette.
- Colours and material palettes for all surfaces and finishes to be determine and may vary for each village area with the aim for the buildings to be visually 'touching the landscape lightly'.

12.8 Social and Community Services

- There is an urgent need for DUAP and NPWS to progress preparation of the Jindabyne and Kosciuszko National Park Settlement Strategy.
- Jindabyne should continue to be the main provider of regional and tourist services, in particular schools, child care, health services and accommodation.

- Further studies are needed to identify the floor space requirements for recreational and entertainment services in the resorts with respect to both summer and winter visitation.
- Need for provision of year round tourist facilities at Perisher Valley.

12.9 Transport and Access

- The balance between road capacity and parking at Perisher Valley and Smiggin Holes should be maintained and therefore, improvements to Kosciuszko Road should be for maintenance purposes only.
- Develop a strategy which aims to get visitors to either Perisher Valley, Smiggin Holes or Blue Cow and then have a strong/improved ski slope connectivity to enable ready access around the range.
- There is to be no net loss of car parking spaces in the resorts area. Any loss of parking at Perisher Valley (for village development) is to be offset by similar capacity elsewhere (ie Smiggin Holes).
- Additional study required of peak parking areas use at Bullocks Flat to determine if space can be reallocated from buses to vehicles.
- The Skitube is to handle the extra transport demand to the resorts area, with no upgrading of Kosciuszko Road other than for safety improvement.
- Need to consider overnight parking in resorts area and the effect on day use area available.

12.10 Ski Infrastructure

- Evaluation of the ski infrastructure proposals contained in the Ski Slope Plan should be conducted and evaluated against the findings of this Study has been finalised and then incorporated, as appropriate, in the SRDP.
- Based on the findings summarised in Section 5 (Natural Environment), consideration of additional
 infrastructure for alpine skiing in new areas should be closely scrutinised in accordance with the
 principles of ESD. In particular, the ecological integrity of areas outside and adjoining the existing
 alpine ski fields should not be compromised.
- Consistent with the transport issues and strategies identified in Section 10, there needs to be an
 objective to improve the integration/connection of the different ski slope areas within the Perisher
 Range Resorts.
- As with other development and infrastructure in the resorts area, the proposed EMS should contain measurable performance criteria and focused monitoring programs that demonstrate the environmental impacts of ski slope development and use and the effectiveness of related management actions.
- The location/capacity of slope lifting facilities needs to be integrated with the access and parking facilities.
- Planning should provide for the integration of cross-country skiing, alpine skiing and the village centre.

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