APPENDIX B. MAPPING OF PRECINCTS

1. General Mapping

The information compiled in the precinct analysis is presented on a series of maps prepared specifically for the SSP.

The maps are designed to be reproduced at A3 size at a scale of 1:5000 or A4 size at a scale of approximately 1:7500 or slightly smaller.

The base maps were prepared from very detailed 1:5000 scale photogrammetry from the 1988 series of ski resort aerial photographs (the most recent photography available when the map preparation commenced) and have been intensively field surveyed to map the vegetation in detail, confirm the accuracy of other features and update the map for changes that have taken place since the aerial photographs were taken.

The maps have been drawn by computer using a Swiss cartographic program, OCAD, which was developed primarily for the preparation of orienteering maps. This program is designed for fine cartographic work and is not a geographic information system (GIS). It does, however, offer considerable flexibility for extracting information from the maps, and for varying the scale, size and orientation for specific planning purposes.

Because of space limitations, there is no comprehensive legend on the map sheets themselves. A general legend covering topographic and planimetric information and vegetation types at a scale of 1:7500 is presented in Figure 1. On maps reproduced at a larger or smaller scale, the size of symbols varies accordingly. There are also few place names on most of the maps to avoid obliterating other important information.

The maps generally present the following topographic and planimetric information.

Contours. These are at an interval of 5 metres and are much more detailed than any previous contour maps of the resort. In some cases the contours describe the shape of large rock outcrops. This needs to be taken into account when interpreting the maps. In a few flatter areas, 2.5 metre auxiliary contours (broken lines) have been added to give further detail of the shape of the terrain.

Water features. Creeks and open water ponds have been included where these were detectable from aerial photographs. Minor creeks through bogs, heath or forest areas which are overshadowed by vegetation are generally not mapped.

Rock features. Rock features are shown only on some maps, being omitted from others for the sake of clarity. Where used, the mapping of rock features is selective, largely determined by visibility in the aerial photographs. Thus boulders (mapped in varying sizes) are more likely to be shown in treeless areas than in woodland. Some obvious rock features have been added during the field survey, but no attempt has been made to do this comprehensively. Cliffs or steep rock faces are sometimes marked but in other situations are indicated only by the close spacing of contours. Bare rock may include both extensive rock slabs or large areas of unvegetated boulder field. The latter may alternatively be indicated by numerous black dots.

Roads and tracks. The hierarchy of roads and tracks includes:

- sealed roads;
- unsealed roads (traffickable by two-wheel-drive vehicles in summer);
- vehicle tracks (designed for four-wheel-drive access only);
- minor tracks (not properly formed) or walking tracks; and
- disused tracks – often old tracks or routes worn by vehicle use (summer or oversnow) without being properly formed. Most of these need either upgrading to a stable condition or rehabilitation. Some of these have been plotted directly from the photogrammetry and may have become revegetated naturally or through rehabilitation works since the photographs were taken. Their locations may still be identified on the ground, however.

Carparks are also shown, with no distinction between sealed and unsealed carparks.

Bridges marked individually are those intended for skier or oversnow vehicle use away from formal tracks.

Ski lifts. Chairlifts, T-bars and J-bars have their tower locations marked and numbered. Rope tows are also shown.

Powerlines. Powerlines (and other overhead lines) are similar in appearance to ski lifts but are represented by thinner lines. Some overhead lines close to roads or tracks have been omitted to avoid congesting the map.

Snow fences. Snow fences are shown with their numbers. Some other fences or barriers which are

not designed as snow fences may also be shown with the same symbol. Some recently erected snow fences may not be shown.

Buildings. Open decks attached to buildings are shown with a white outline. Very small buildings (e.g. lift operators' huts) may not be represented to scale.

Other features. Other features include reservoirs, radio masts and weather stations.

Precinct boundaries. The boundaries between precincts should be treated as indicative only. Where they are intended to follow a well-defined geographic feature (e.g. Perisher Creek), they have been drawn slightly offset from the feature for clarity.

2 Mapping of Vegetation Communities

2.1 Introduction

Vegetation is generally the most useful indicator of environmental significance or sensitivity, reflecting factors such as past soil disturbance, groundwater, wind exposure and snow accumulation, as well as being important in its own right. Using the base maps, comprehensive vegetation mapping was undertaken of the whole of the area covered by the SSP. The vegetation maps are more accurate, more detailed and more comprehensive than any previous vegetation mapping undertaken at this scale within the resort and supersedes all previous mapping (e.g. Refs. 1 to 5, see Ref. 6 for further discussion).

The vegetation classes adopted (see Figure 1) were selected primarily because of their usefulness for ski slope planning, rather than any strict botanical classification but, in most cases, correlate with classes used in previous vegetation mapping studies in ski resorts and other alpine areas (see Section 2.6 for further discussion).

As is common in vegetation mapping, the classes selected represent a continuum in ecological characteristics and often do not display sharp physical boundaries. This continuum in ecological characteristics is shown notionally in Figure 2. The classification system and the mapping must be interpreted with these limitations in mind, but is nevertheless valuable in indicating the broad physical and ecological constraints that need to be considered in ski slope planning.

Individual trees have commonly been mapped, particularly where they were large enough to be detected in the photogrammetric plot. There are some areas, however, where small, sparsely scattered trees are not shown (e.g. upper western slopes of Mount Piper, upper northern slopes of Mount Back Perisher, upper eastern slopes of Blue Cow Mountain).

There will be other minor inaccuracies in the vegetation mapping, particularly in areas which are not developed or used intensively for skiing. These will generally not be critical for ski slope planning purposes, and can be corrected progressively as required.

The main divisions of vegetation classes are as follows:

- Snowgum communities – trees are a potential constraint on ski slope development.
- Dry heath/herbfield communities – few constraints on skiing during good snow cover, heath removal may be necessary to achieve a high standard of winter grooming under marginal snow conditions or if artificial snowmaking is used.
- Wet communities – generally sensitive to disturbance in hydrological and ecological terms, minimal constraints on skiing during good snow cover but potential problems with water accumulation during marginal snow conditions or if snowmaking is used.
- Specialised communities – relatively restricted in distribution, may provide physical and/or ecological constraints on development, although generally not on skiing use during reasonable snow cover.

Within these divisions, the following vegetation classes have been identified:

2.2 Snowgum communities

Climax snowgum community (Type 1). The majority of trees are very old, and the heath understorey is relatively open. This is believed to reflect the original snowgum woodland characteristics of the Park prior to disturbance by grazing and associated burning and before the major bushfires of 1939. Because of the extreme age of the trees, the associated ecological and aesthetic values, and the relatively small proportion of this type of snowgum community within the Park, these tree stands are rated more highly for protection than most other snowgum communities. The trees are often well spaced, permitting informal skiing between them on ungroomed trails.

Mature snowgums (Type 2). This differs from Type 1 mainly in that the understorey has a high component of dry heath, which may partly reflect local site conditions but also the fact that the area is still undergoing ecological succession towards a climax state. Because of the age of the trees, they have relatively high conservation value. Due to the dense heath cover, informal skiing between the trees tends to be constrained.

Figure 1. Standard map legend

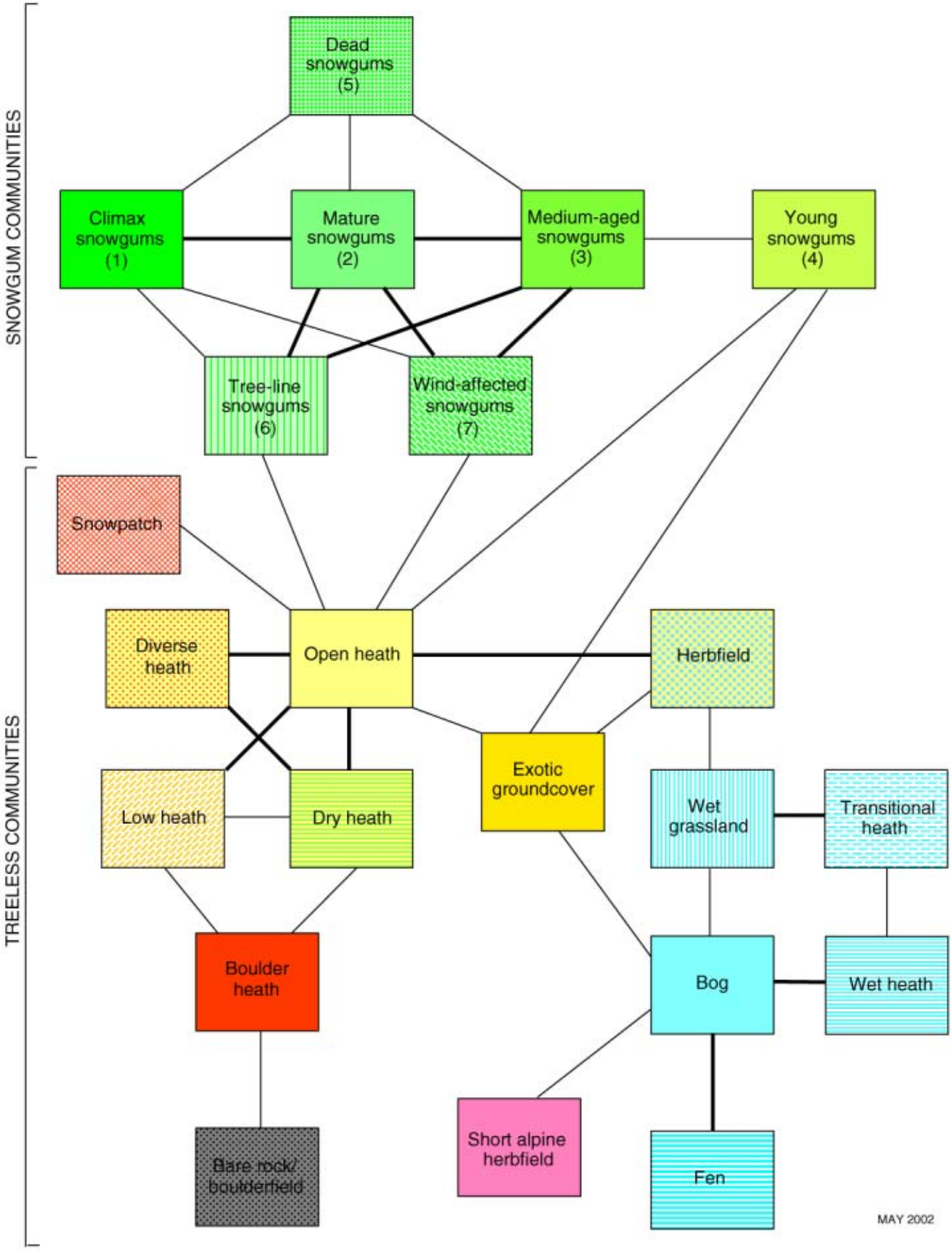

Figure 2. Relationships between vegetation classes

The mapping of vegetation classes which are connected by lines may not always reflect clear distinctions in the terrain due to a gradual transition in vegetation characteristics, with the lack of a distinct boundary, or their existence as a mosaic in which only the most common class has been mapped. The heavy lines indicate the class relationships for which such situations are most common.

Medium-aged snowgums (Type 3). This class typifies the majority of the snowgum stands within the resort, probably reflecting a partial recovery from past disturbance, including the January 1939 bushfire which burnt through part of the resort area. The understorey density is variable, but generally consists of moderate to dense dry heath. The tree density is generally too high to permit skiing without some clearing of trails.

Young snowgums (Type 4). These range from young regrowth to saplings a few metres high, with a variable understorey. In some cases, they may represent regeneration from past ski slope clearing.

Dead snowgums (Type 5). This classification is used for stands where most of the trees are dead or in poor health as a result of disease, insect attack, fire or old age. While dead trees can have ecological value (e.g. in providing nesting hollows), this is less relevant in subalpine areas than in lowland woodland communities, and the dead tree stands are generally less of a constraint than living tree communities.

Tree-line snowgums (Type 6). These trees grow at the limit of altitudinal conditions which will support tree growth. The severe environment stunts growth, with the result that tree size is not a reliable indication of age and relatively small trees may have high conservation value (comparable with Types 1 and 2) on this basis. The tree density within these communities is often low, making skiing between trees feasible except on major trails.

Wind-affected snowgums (Type 7). This class overlaps with Type 6, with such trees commonly occurring in tree-line situations. They are identified as a separate class, however, because they indicate a high frequency of extreme wind conditions which can result in poor snow accumulation, unpleasant conditions for skiers and poor operating reliability for chairlifts. The shape of the trees generally indicates wind direction (wind vaning), which may be relevant in determining the optimum alignment of lifts.

2.3 Dry heath/herbfield communities

Dry heath. This is an almost continuous cover of common dry heath species such as *Phebalium ovalifolium*, *Prostanthera cuneata*, *Orites lancifolia*, *Ozothamnus secundiflorus*, *Ozothamnus alpinus*, *Olearia phlogopappa* var. *flavescens*, *Olearia phlogopappa* var. *subrepanda* and *Hovea purpurea*. Grasses and forbs tend to be suppressed beneath the dense heath canopy, but can develop if the heath is removed. It is of moderately high habitat value for common species, providing cover from predators during summer, as well as allowing animal movement below the snow cover in winter. In favourable snow situations it collapses under the weight of the snow to form a good base, but in more exposed situations where snow cover is often marginal or on intensively groomed trails, it is often desirable from a skiing viewpoint to clear the heath.

Open heath. This is similar botanically to the dry heath class but is more variable in terms of heath density, with a mosaic of heath and grassland/herbfield, which is too complex to map at the present scale. The classification used covers a wide continuum of community mixes, ranging from dry heath with small open patches to predominantly herbfield with some areas of heath. The comments with respect to grooming of dry heath areas are applicable also to this class.

Diverse heath. This is a type of dry heath occurring particularly on lower, more sheltered slopes. It is dominated by *Phebalium ovalifolium* and *Prostanthera cuneata*, but has a high diversity of other heath species and a herbaceous understorey containing grasses and often the sedge, *Empodisma minus*. It appears to reflect a relatively cool and moist (but not wet) environment which has been considered to be particularly favourable as habitat for the Broad-toothed Rat (*Mastacomys fuscus*). The slope grooming characteristics are similar to those for dry heath although, being lower on the slopes, it is generally located favourably with respect to snow accumulation.

Low heath. This occurs in very exposed sites, particularly on the tops or windward sides of ridges. A common species is *Kunzea muelleri*, but many other heath species, often in a stunted form, occur in these areas. It is a slow-growing community, relatively sensitive to disturbance because of the difficulty of recovering in its extreme environment. The areas where it occurs, however, tend to be unfavourable for skiing because of wind exposure and poor snow accumulation, with an icy surface. For this reason it is generally unlikely to be affected by ski slope development.

Herbfield. There is relatively little pure herbfield within the Perisher Blue Resort, this community generally occurring as a mosaic with dry heath and being mapped as a component of open heath. Where it does occur, it is ideal for skiing, being suitable for unconstrained use with no summer grooming other than possibly rock removal. Because it is so open, however, it does not constrain summer vehicle movement but is very sensitive to damage by vehicles, necessitating strict control over vehicle movement in these areas. It is a common habitat for the threatened plant, *Ranunculus anemoneus*, which is relatively common in many parts of the resort.

Exotic groundcover. This classification covers areas which have been disturbed by previous development works on the ski slopes, in the villages or as part of the Snowy Mountains Scheme, and which have been rehabilitated using introduced grasses and clovers. In many of these areas, a high

component of introduced weeds has developed. Because their natural ecological quality is low, these areas would be favoured for further development, subject to other environmental attributes being suitable (e.g. not on steep or unstable slopes). Some areas of exotic groundcover are gradually reverting to native herbs and heath, the rate of this process being related inversely to the vigour of the introduced species. These areas are also important in that they have the potential for active native revegetation measures in a way that does not unduly compromise their skiing values as part of the long term strategy of the Ski Slope Master Plan.

2.4 Wet communities

Wet heath. This is the most common of the wet communities within the resort, consisting of several different botanical associations. One type, characterised particularly by *Richea continentis* and the sedge, *Empodisma minus*, commonly occurs on poorly drained terraces on the slopes. Another common situation for wet heath, particularly containing *Baeckea gunniana*, is along watercourses or other shallow drainage lines. Wet heath containing the above species and also *Epacris paludosa* is common also on flat valley floors, and there are other poorly drained situations throughout the ski slopes where the community is present. A third type of wet heath, dominated by *Callistemon pityoides*, occurs in the planning area mainly on the northern slopes of Blue Cow Mountain (Precincts 10 and 12), where development is minimal, and on the lower eastern slopes of Precinct 8, above Perisher Creek. These three types of wet heath are not distinguished in the mapping, although the details are partly recorded in supplementary notes.

The significance of wet heath in ski slope planning is twofold. First, it may indicate difficult ground conditions for development, particularly if excavation or track construction is required, as well as indicating the potential for surface water accumulation which reduces snowholding. Second, wet heath areas are considered to have relatively high ecological values compared with the other common heath communities, including habitat for some uncommon plant and animal species. For both these reasons, it is desirable to avoid encroaching on wet heath areas as far as practicable or to implement special safeguards where such encroachment is unavoidable.

Bog. Bog, characterised by the presence of *Sphagnum* moss, commonly occurs in association with wet heath, often as a mosaic of the two communities. Some bogs have developed areas of *Carex* fen (see below) along drainage lines or in depressions. The constraints and ecological significance of bog areas are similar to those associated with wet heath, but are probably more critical. Bog containing pools of open water is prime habitat for the Corroboree Frog (*Pseudophryne corroboree*) and the Alpine Water Skink (*Eulamprus kosciuskoi*), both of which are species of high conservation significance within the Park. Several rare or threatened plant species commonly grow in bogs.

Fen and other open water. Fen consists of pools and watercourses dominated by *Carex* sedges, commonly *C. gaudichaudiana*. Most of these are too small to be mapped at the scale used but there are some exceptions. Not all the *Carex* vegetation occurs in fens, as *Carex* appears to be an early coloniser of disturbed wet areas, which can regenerate eventually to *Sphagnum* bogs.

Fens and other open water are relatively uncommon within the resort but, where they occur, can be critical as a constraint or even a hazard in ski slope development. The desirability of removing open water from the ski slopes is often tempered by the habitat value of such areas in association with adjacent vegetation communities (e.g. pools within bogs).

Transitional heath. Characterised particularly by *Epacris petrophila*, this community occurs in a mosaic with other wet communities along the broad valley of Perisher Creek and in other similar situations within the resort. The commonly used term 'transitional', is perhaps misleading as it is a distinct community in its own right, rather than representing a transition between other heath types. (In the latter context, there are situations where a combination of common wet heath and dry heath species occurs, which is more 'transitional' in a literal sense, but these have been mapped as one of the other heath types). The ecological values and constraints of transitional heath are similar in nature to those associated with wet heath, with these areas providing habitat for some threatened plant species and an incipient groundwater problem for development involving excavation. Transitional heath areas, however, tend to be better drained than those containing wet heath.

Wet grassland. Wet grassland commonly occurs in a valley situation as a mosaic with transitional heath or bog. It is also present in some poorly drained sites on the upper slopes. It is less of a constraint than the other wet communities, but is nevertheless a planning consideration for similar reasons.

2.5 Specialised communities

Snowpatch. Snowpatch areas occur on sheltered slopes where the snow cover survives relatively late into the spring (or even summer) with the result that the growing season for plants in this area is limited, and the vegetation cover is relatively sparse. Because of good snow accumulation, these areas generally do not require summer grooming, other

than to remove major protruding rock outcrops. Because they form in hollows on the slope, they tend not to be in locations favoured for lift towers. Where they are disturbed by development, however, recovery from disturbance is likely to be slow.

Short alpine herbfield. This is a wet community, occurring at the base of a snowpatch, where it can be fed well into the summer season by the melting snowdrift. It provides habitat for some rare or threatened plant species and is particularly sensitive to disturbance (e.g. by passage of vehicles or regular trampling). Because such areas are relatively few and limited in extent, their conservation value is considered to be high. Their physical location with good snow cover means that they are unlikely to be directly affected by slope grooming or other ski slope development. It is important, however, to ensure that they are not used as hollows for the disposal of rock outcrops removed from the surrounding slopes.

Boulder heath. Boulder heath is an accumulation of boulders overgrown with (mainly) dry heath species, in particular the Mountain Plum Pine (*Podocarpus lawrencii*). This species is of particular interest in its own right as an extremely slow-growing species, and also because of its key role in contributing to the prime boulder heath habitat of the Mountain Pygmy-possum (*Burramys parvus*). The Mountain Pygmy-possum is one of the most critical species in terms of ecological management within the alpine and subalpine areas, hence protection of its prime habitat has high priority in ski slope development. Many of the boulder heath areas within the resort are established as scientific sites for monitoring *Burramys*. Apart from its ecological values, boulder heath is one of the most difficult areas in which to undertake effective summer grooming of ski trails.

Bare rock. There is a considerable amount of bare rock within the resort, most of which occurs as outcrops, cliffs and boulders which are too small and too numerous to map comprehensively. The more extensive areas are shown on the maps. Some of these support limited areas of other vegetation communities in bands between the main rock exposures.

3. Archaeological Assessment

The assessment of archaeological sensitivity is taken from an Aboriginal cultural heritage study undertaken for the NPWS by Navin Officer Heritage Consultants (Ref. 7). This study was completed subsequent to the initial preparation and release of the SSP in April 2000, and superseded an earlier archaeological survey undertaken for Perisher Blue (Ref. 8). The latter study was confined to those areas of high archaeological sensitivity within the resort which were likely to be physically affected by SSP developments.

The basis for mapping areas according to level of archaeological sensitivity for Aboriginal artefacts is as follows (Ref. 7):

Zone containing areas of high archaeological sensitivity. Areas of potential in this zone include relatively flat, well drained, locally elevated, sheltered ground, especially in the lee of boulders and within woodland or scattered woodlands without a predominant heath understorey.

Areas which fall within this zone but which are not considered to have archaeological potential are those which are:

- steeply graded, poorly drained and low lying;
- unsheltered and exposed to the prevailing weather;

or which have a predominantly heathy understorey.

Zone containing areas of low to moderate archaeological sensitivity. Areas of potential in this zone include:

- relatively flat, well-drained, locally elevated ground in less sheltered or relatively open contexts, and/or occur within areas of cold air drainage;
- some areas classified as heathland which otherwise may be classed as having potential;
- areas which have reduced potential due to development related ground disturbance; and
- smaller areas of potential not situated on major ridge or spurline contexts.

Areas which fall within this zone but which are not considered to have archaeological potential are those which are:

- steeply graded, poorly drained and low-lying, or
- fully exposed to the prevailing weather.

Zone containing areas with potential for deep subsurface archaeological deposits. This zone is not considered to include archaeologically sensitive deposits within the existing upper soil profile or ground surface. This zone identifies the limited potenital for archaeological deposits to occur within undisturbed palaeosols (fossils soils) which may survive at depth within quaternary valley floor infill sedimentary deposits.

Zone with no or negligible archaeological potential. This zone consists of all remaining topographies following the exclusion of the above categories.

Within the margin of error resulting from the assumptions and diagnostic constraints of the

present project, this zone is not considered to include topographies with potential to contain stone artefact occurrences.

The zone classification relates to stone artefact occurrences, but not to scarred trees, and rock shelters which are very rare site types within the alpine and subalpine region.

References

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