

APPENDIX C. SKIING CAPACITY

1. Introduction

To assess the operational benefits of increasing lift capacity and undertaking further slope grooming, two skiing capacity models have been developed for application to the SSMP. Both of these predict the theoretical number of 'skiers at one time' (SAOT) achievable on the slope, one based on the available lift capacity and the other on the area of skiable snow (slope capacity or trail capacity). The SAOT figure, also known as the 'comfortable carrying capacity' represents the number of skiers that can be safely and comfortably supported by the resort's lift and trail system while providing a quality experience to each skier ability level. It is a design day figure which is determined through an interpretation of lift and terrain capacities to accommodate peak attendance given certain quality objectives. These relate principally to lift queue times, trail densities, slope gradients, skier skill classifications and the need to provide the skier with a minimum number of vertical transport metres per day (VTM or total vertical drop experienced by each skier).

Lift capacity and slope capacity in the various parts of the resort were previously assessed for the NPWS by Ecosign – Mountain Recreation Planners Ltd in 1990 (Ref. 1). These estimates, however, are not considered sufficiently detailed for the present stage of ski slope planning. More detailed models have been developed based on similar principles to the Ecosign analysis but which reflect more detailed analysis of environmental characteristics, skier ability and winter grooming operations.

2. Lift capacity

The lift capacity model assesses the capacity to take skiers up the slope based on design day criteria for queue times, which are set at a maximum of 10 minutes for most lifts and 15 minutes for the Perisher Express Quad Chairlift. This model takes account of skier ability mix, which is reflected in downhill skiing times, and the minimum VTM typically skied by persons of different abilities.

The minimum VTM will differ widely with skill level as indicated as follows, based on data from the Ecosign report (Ref. 1):

Skill level	VTM
Level 1	560 metres
Level 2	1,360 metres
Level 3	2,030 metres
Level 4	2,580 metres
Level 5	3,070 metres
Level 6	3,210 metres
Level 7	3,590 metres

For the purposes of the SSMP, a method has been developed (Ref. 2) for calculating a SAOT figure for each lift which takes into account:

- uphill ride time, based on field measurements;
- downhill descent time for different skier ability levels, based on field measurements or extrapolation;
- queue times (maximum set for each lift as above);
- minimum VTM for different skier ability levels;
- percentages of different skier ability levels using the lift, based on field observations and cross-checked with the known overall distribution of skill level throughout the whole resort (see Figure 2.3 of text);
- average hours skied per day by skiers of different ability levels (assumed figures); and
- lift design capacity, based on theoretical capacity adjusted to take account of known inefficiencies due to use of the lift by inexperienced riders or for skier circulation rather than repeat skiing.

It does not include 'inactive skiers', i.e. skiers who are present in the resort but who elect not to ski that day.

The method developed in the SSMP for calculating SAOT based on lift capacity is more sensitive than those commonly used for ski slope planning in that it has the flexibility to take account of the varying demands and abilities of skiers of different skill levels using the same lift/trail system.

3. Slope Capacity

A figure for potential SAOT can be derived also from a consideration of slope capacity, taking account of the proportion of skiers who would be inactive at any one time (Ref. 3). This figure should ideally be greater than the SAOT figure derived from lift capacity as above. If it is less, this indicates that the slope area is insufficient to safely and comfortably handle the number of skiers being transported by the lifts. Such a situation is unlikely at Perisher Blue except at times when the slope area is constrained by the availability of artificial snow.

The slope capacity model used in the SSMP is based on measuring the total area of skiable terrain within each 'pod' (or skiing area served by a lift or group of lifts), and estimating slope capacity based on the extent of grooming, the presence of tree cover and other constraints as well as the mix of skier ability (see Ref. 3 for further details). The areas on which

slope capacity is based are confined to those used for repeat skiing, and do not include trails used solely for skier circulation. In some cases, use of a run may depend on more than one lift, and the areas may be allocated for convenience just to one lift or spread over the different lifts. Areas containing dense tree cover may be excluded from the measured areas for purposes of calculating slope capacity.

A comparison is made between lift capacity and slope capacity to check that there is an appropriate relationship between them. With normal operations under optimum snow and wind conditions, the slope capacity at Perisher Blue would be well in excess of lift capacity in most areas because of the large area of terrain.

4. Capacity under Constraint Conditions

The achievement of the full estimated lift or slope capacity is constrained at times by the extent of snow cover or by wind conditions. The capacity of the resort has been assessed under a series of constraint conditions as follows:

Marginal snow with snowmaking (early in season). This is based on having insufficient natural snow for skiing but having artificial snow made on all the repeat skiing runs and circulation trails proposed at full snowmaking development, with the possible exception of the Blue Cow Expressway and Perisher Home Trail between the Perisher Express and Pleasant Valley, which do not affect repeat skiing capacity under these conditions. However, not all of these snowmaking areas would be operational during the first few weeks of the season. Hence the slope and lift capacity at the start of the season may be less than the figures quoted, but would increase gradually as the artificial snow cover is extended.

Marginal snow late in season. The pattern of snow loss across the resort can vary from year to year. For example, in some years snow may be lost from Smiggin Holes while a good cover is retained on Mount Perisher. Less commonly, localised snow losses in critical places on Mount Perisher may force it to close while Smiggin Holes remains operational. The assessment for each precinct is based on a typical worst case situation for that precinct under conditions when late season snow loss is affecting the resort as a whole. In some areas, localised snow loss may marginally reduce slope capacity while most of the area remains skiable, but such minor reductions have been ignored.

High wind. This reflects the situation experienced on several occasions during a typical season when the most exposed lifts (mainly aerial lifts) are closed for safety reasons but other similar lifts in more protected locations continue to operate. Under the most extreme wind conditions or if the wind is not from the usual direction, some of the latter lifts may also be affected.

High wind with snowmaking. This reflects the situation early in the season when the resort is operating on artificial snow and experiences high wind conditions.

5. Limitations of the Models

It is important to appreciate that, as with any mathematical model, these models are only approximations for the real world and incorporate a number of assumptions and generalisations. Despite such limitations, they are considered to be sufficiently accurate for the SSMP and are considered superior to previous methods. While lift and slope capacities are generally quoted to the nearest whole number for convenience, it is not meaningful to apply them to this level of accuracy.

Skiing capacity is most critical during the peak periods of the day for repeat skiing, namely mid-morning and mid-afternoon, when most people are likely to be actively skiing. Even at this time, however, there would be a small number of skiers who would not be using the slopes (including lifts and queues) plus a small number of beginners who have not advanced to the stage of using lifts. The total number of active skiers that could be accommodated at the resort under design day conditions would therefore be slightly more than estimated in the SAOT figures. No accurate estimate has been obtained of this factor under the conditions modelled, but it is anticipated to be of the order of 5 to 10 percent.

References

1. Ecosign – Mountain Recreation Planners Ltd. *Kosciusko National Park ski slope capacity study*. Report to NPWS, April 1990.
2. Hogg, D. *Perisher Blue Ski Resort ski slope capacity model*. Perisher Blue internal working paper. June 1997.
3. Hogg, D. *Calculation of slope capacity*. Perisher Blue internal working paper. January 2000.