SECTION II

EVALUATION OF CORONET PEAK SKIFIELD

Sections II and III comprise of an evaluation and comparison of skifield characteristics at Coronet Peak and Rastus Burn. This is for two main reasons:

(a) The rationale behind the Rastus Burn proposal is that it will provide more favourable conditions for skiing than at Coronet Peak. Therefore, an assessment of relevant conditions at both sites is necessary for a valid evaluation of the Rastus Burn proposal.

(b) It is necessary to determine the degree to which Coronet Peak is currently utilised, and its potential for further use.

As a planning principle, the full utilisation of existing amenities in a district should take precedence over unnecessary new developments, in particular those which may infringe on existing users as well as providing risk of future public liability. The factors to be considered in this evaluation are:

(i) ski slope extent
(ii) reliability of snow cover and length of season
(iii) slope carrying capacity
(iv) present and potential slope utilisation
(v) skier market demand
(vi) design capacity

2.1 Ski Slope Extent

Branch and Rowan[13] have devised a system for classifying ski slopes to suit varying skier abilities. These I have used as the basis for determining slope availability for each ability level.

TABLE 1. SLOPE CLASSIFICATION BY SKIER ABILITY

SKILL CLASSIFICATION (Branch and Rowan)	ACCEPTABLE TERRAIN	
	Gradient	Pitch
Beginner	10-15%	6-8.5°
Novice	15-25%	8.5-14°
Low intermediate	25-35%	14-19°
Intermediate	30-40%	17-22°
Advanced intermediate	35-45%	19-24°
Advanced	45-50%	24-31°
Expert	60% plus	31° plus

Branch and Rowan's skill classifications and acceptable terrain gradients are identical to those recommended to Alex Harvey Industries as the preferred grade of ski runs for their Turoa development[14]. The gradients advocated by Rogers[12] are gently by comparison. For instance his 5% maximum gradient for beginner skiers is 6% gentler than the upper half of the Chalet beginners' slope, which the Mount Cook Company constructed specifically for beginners. Similarly, the upper part of the constructed Happy Valley novice run is 4% steeper than his maximum of 10%. In contrast to Rogers' figures, Forward[4] estimated that **"5-10° or 12°"** (9-17/21%) are suitable gradients for beginners, these being in the same order of Branch and Rowan.

Using the Branch/Rowan classification system during the 1979 ski season, I conducted a slope analysis of Coronet Peak, making approximately 90 measurements by 'Abney' level. At the same time I mapped the extent of skiable terrain using both my past experience of skiing at Coronet Peak during the last 12 years, and what I observed at the time of the survey. These areas can be regarded as reliably skiable, mid-season (August) most seasons.

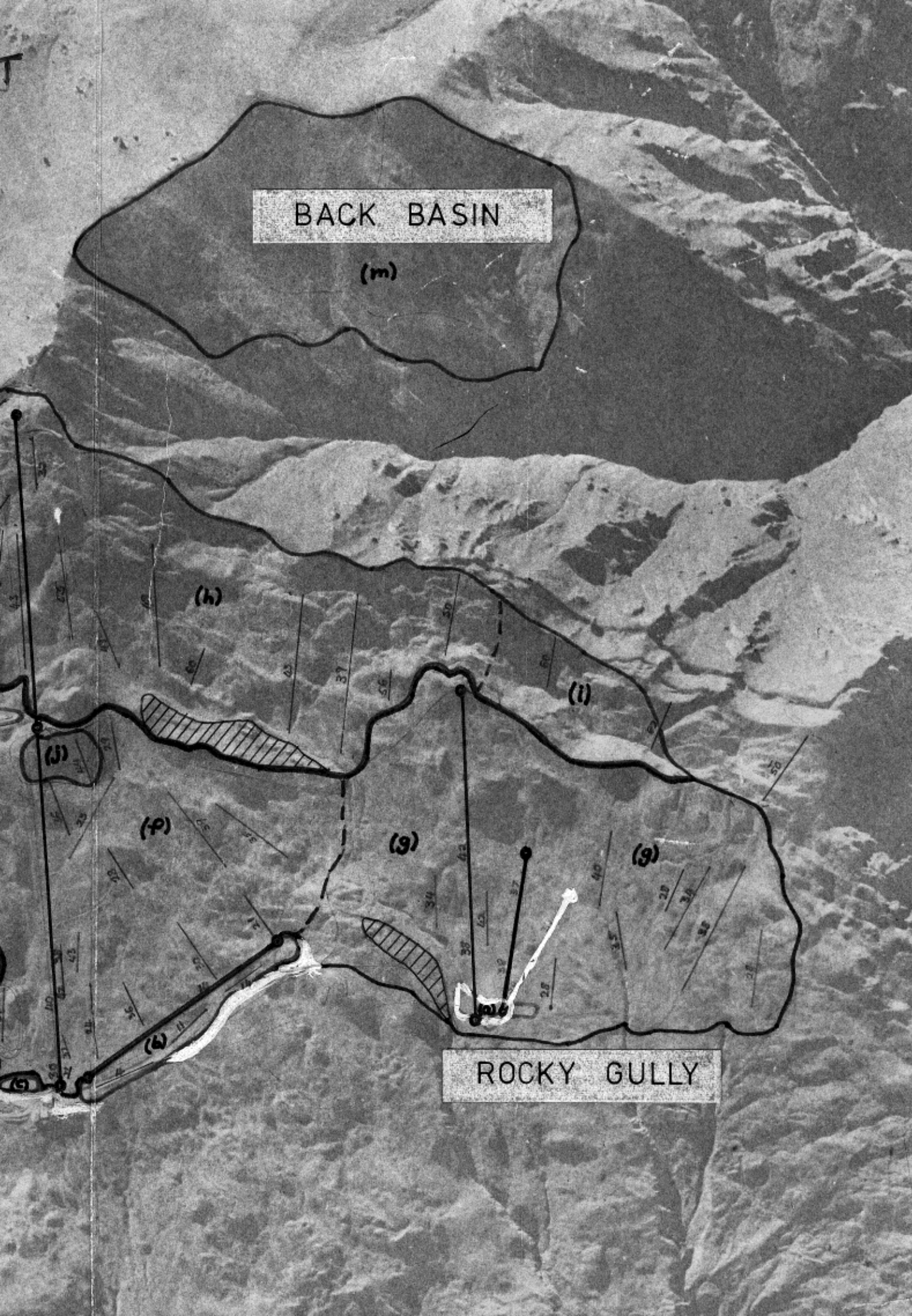
For the sake of clarity on Plan 1, the skill classifications are broad-banded into 3 categories:

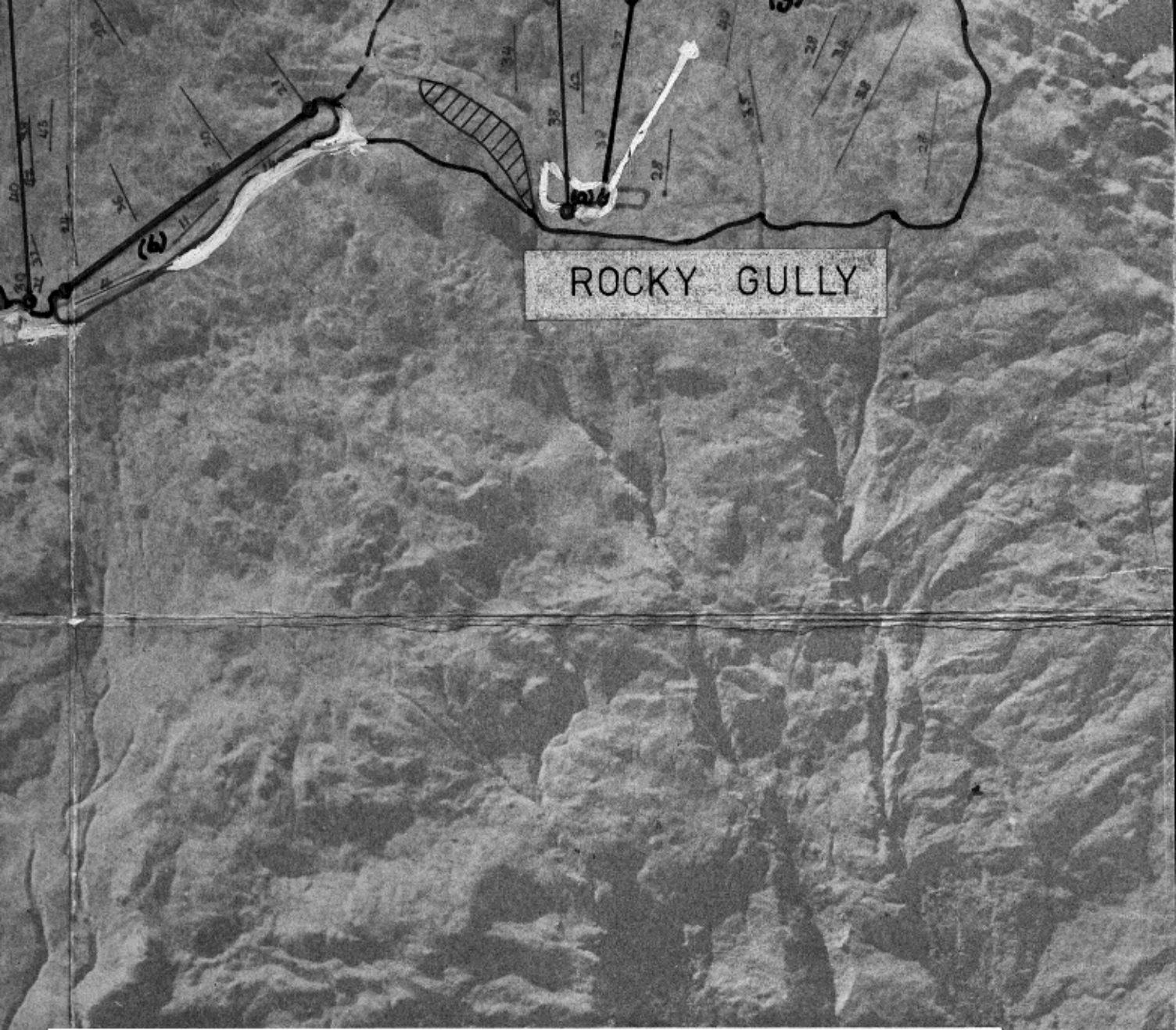
a) beginner-novice

b) low intermediate to intermediate

c) advanced intermediate to advanced to expert

PLAN 1


BACK BASIN
(m)
(h)
(i)
(j)
(p)
(g)
(g)
(b)
ROCKY GULLY



CORONET PEAK

240 ha.

EXTENT RELIABLY SKIABLE TERRAIN : olid line (all colours)
USUALLY UNSKIABLE TERRAIN : naded

SLOPE ANALYSIS BY SKIER ABILITY

beginner — novice —
intermediate —
advanced intermediate — expert —

slope sub-divisions dotted line
area reference (h)
ski lifts (existing)
gradient (%) 42

N

SCALE 1: 8080

B. J. MASON SEPT. 1979

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The areas of the larger intermediate and advanced slopes were planimetered from Plan 1, and the beginner-novice slopes were measured on-site. These are tabulated on the left of Table 2.

TABLE 2. CORONET PEAK : SKI SLOPE EXTENT AND SLOPE CAPACITIES

Area Reference (Plan 1) Location	Area (ha)	Slope Density	Slope Capacity
BEGINNER (Green on Plan 1)			
a. Rocky Gully	0.38	125/ha	50
c. Chalet	0.18	125/ha	25
d. Halfway	0.66	190/ha	125
n. Lower Gullies	0.35	125/ha	45
	1.57		245
NOVICE (Green)			
b. Happy Valley	1.4	75/ha	105
LOW INTERMEDIATE to INTERMEDIATE (Brown)			
e. Greengates	30	20/ha	600
f. Main Slope	64	20/ha	1280
g. Rocky Gully	38	15/ha @ 30/ha; 23/ha @ 20/ha	901
	132		2790
ADVANCED INTERMEDIATE - ADVANCED - EXPERT (Blue)			
h. Top Half	42	10/ha	420
i. Above Rocky Gully	6	-	-
j. Halfway	1	15/ha	15
k. Lower Triple Chair	6	10/ha	60
l. Lower Gullies	19	-	-
m. Back Basin	32	-	-
	106		495
TOTAL AREA:	240 ha	TOTAL SLOPE CAPACITY:	3635

The total skiable area is 240 hectares, however, an area of 183 ha is obtained by deleting advanced slopes i, l and m on Plan 1 which are the least attractive for servicing by lifts.

2.2 Slope Carrying Capacity

Skier carrying capacity is a critical judgement of the density of skiers that can be accommodated on the slopes at one time and still maintain a satisfactory recreational experience. This is in addition to providing sufficient economic return for successful commercial operation. The concept of skier carrying capacity is relatively new in New Zealand with only one comprehensive attempt to date to define Carrying Capacity, at Whakapapa on Mount Ruapehu.

The Tongariro National Park Board initiated a survey in August 1977[3] to document existing skier distribution on the skifield, to record skier preferences, to investigate better utilisation of slopes that are already serviced by lifts, as well as determining the capacity of new slopes. The skier densities adopted by the Whakapapa planning team are considerably lower than those commonly accepted in North America. After consideration of snow and topographic conditions, and the National Park status of the skifield, a low density and hence high-quality skier experience was opted for.

To arrive at appropriate skier densitities for Coronet Peak, a comparison of various recommended densities, and an interpretation of such figures to suit the topographic and snow conditions is necessary.

TABLE 3. COMPARISON OF SKIER SLOPE DENSITIES

Skill Classification	Branch/Rowan per ha	Whakapapa per ha	Coronet Peak (Mason)
Beginner	125-250	100	125 and 190
Novice	100-150	50	75
Low Intermediate	75-125	15-20	30
Middle Intermediate	50- 85	12	20
Advanced Intermediate	40- 50	8-10	15
Advanced	25- 40	5- 8	10
Expert	25- 40		10

Whakapapa is characterised by extensive rock slopes, bluffs and extremes in gradients[10], this being quite unlike Coronet Peak. Sir Henry Wigley[6] described Coronet Peak as "**not a high mountain, in fact it is only 1646 m above sea level, but it is ideally suited for skiing. The rock structure lies in such a way that it slopes away to the south in a series of gentle dips and hollows which make for fun skiing. There is an almost complete absense of rocky outcrops, so it is possible to ski over much of the area on a slope of one's own choosing. It's south-facing slopes are reasonably sheltered from the prevailing winds and the direct rays of the sun, with the result that the snow often remains dry and powdery for many days on end. It is also less subject to thaw than less favoured slopes in the area.**" Wigley[6] further states that "**Coronet Peak is endowed with the natural features of good terrain, usually good snow conditions, and good weather ..**"

In terms of acceptable skier densities, terrain is only a minor constraint (hummocky slopes, compared to an ideal of smooth slopes which would allow more even distribution). The quality of skier experience, and sustainability of adequate snow cover under skier traffic, are the limiting constraints to attaining the high American densities of Branch and Rowan. Snow cover on Coronet Peak is light compared to that experienced in most areas of North America, and could not sustain similar usage.

The "Shirt Front" beside the double chair lift is the only area on Coronet Peak that I have observed to regularly exceed its physical carrying capacity mid-season. Future management options could be directed towards distributing usage more evenly, or by the use of modern snow-making techniques if practicable.

The other limiting constraint is the quality of recreational experience appropriate to Coronet Peak. It is currently designated Recreation Reserve, with recreation as its primary management objective. In a national park situation as in the case of Whakapapa, skiing is, or should be conditional on preserving the natural environment, as well as retaining a relatively low-density, high quality National Park experience. Therefore modification of the natural environment to attain heavier usage, is generally more acceptable in a non-national park setting if fragile ecological conditions do not exist. These considerations have influenced the densities I have adopted for Coronet Peak, as well as the high degree

PHOTOGRAPH 2

CORONET PEAK : DOUBLE CHAIR TO HALFWAY
24 September 1979

B J Mason

There is very light skier patronage despite clear weather conditions and adequacy of snow cover. Good snow cover remains on the "Shirt Front" this side of the double chair lift, despite it being the heaviest used major ski run of the whole skifield.
Bare areas in foreground are due to high receipts of solar radiation on the gentle gradients, and ski wear.
Greater snow cover beside the triple chair (rear) is due to lighter skier densities earlier in the ski season and generally steeper gradients (lower solar irradiation).
Skifield closed for the 1979 season on 30 September.

of modification that has already occurred through skifield development.

2.2.1 Beginner Slopes:

The Chalet Beginners' Slope is the only area in continuous use by the Ski School and individuals. This is primarily due to its convenient location at the base of the skifield, immediately adjacent to the existing base facilities. Area 1800m^2.

Reference: Appendix 2

Rocky Gully has a short fixed grip beginners' lift below the bottom terminal of the Blue Gum Poma. This is very poorly located with the upper half of the slope too steep for beginners. The potential exists for the creation of two adjacent beginners' slopes at the base of the Rocky Gully and Blue Gum Pomas, with a total area of 3800m^2 or twice the existing Chalet beginners' area.

Reference: Appendix 3

Within an enclosed depression in the Lower Gullies area there is scope for the formation of a 3500m^2 beginners' slope. This would entail substantial earthworks, none of which would be visible from outside of the depression.

An access track suitable for a shuttle vehicle service commencing opposite the Otago University Ski Club hut, would need to be constructed for approximately 500m with a maximum grade of 1:8. As the area is separate from the existing facilities, it would probably only be necessary to develop it when other alternatives reached full capacity.

Half-way up the double chairlift, at 1434m is a small beginners' area (1100m^2) which has been formed and a fixed grip lift installed. This is infrequently used. Access to this slope involves running the chair lift at half-speed for the loading and unloading of beginners. The Company's stated reluctance[4] to utilise this slope due to disruption to other skiers, is at variance with the existing practice of running the lift at half speed for winter sight-seers. If the need for additional beginner slopes is all that pressing, and beginners are as lucrative as claimed[4], then it is merely a management decision as to who has priority - beginner or sightseer?

An additional 3700m^2 can be provided at the Halfway area with little or no earthworks, and with a protective fence to exclude other skiers. By filling in the depression known as the "Elephant Pit" a further 1800m^2 could be provided.

Full utilisation of this site would provide 6600m^2 of beginner slopes, or 3.5 times the Chalet slope. A further advantage of this site is its greater snow depth than the existing or potential beginners' areas on the lower slopes. I have not seen bare areas on this slope in mid-August during any of my skiing visits to Coronet Peak. Fitzharris[15] has recorded a "snow-wedge" of increasing snow depth with increasing elevation on Coronet Peak confirming a general observation that the upper half of the mountain is usually skiable in winter on those occasions when the lower slopes are unskiable.

Reference : Appendix 4 , Photograph 3

Beginner Slope Capacities. All beginner slopes are or could be formed into smooth, open slopes with no obstructions or hazards such as at Whakapapa. Therefore the beginner densities could be higher at Coronet Peak. I have adopted the lower Branch and Rowan figure of 125/ha which is 25% higher than at Whakapapa.

A total of 250 skiers could be accommodated on the slopes at one time, i.e. skiers actually skiing, and not those in queues or on lifts.

Reference : Table 2

Due to its greater snow depth, the Halfway beginners' area could sustain heavier usage than the lower slopes. At a factor of 50% greater density, this would allow a slope density of 190 skiers/ha which is still less than the maximum recommended figure of 250/ha of Branch and Rowan (Table 3). In comparison with the existing Chalet beginners' slope, with no or minimal earthworks, four times this area could be provided elsewhere on Coronet Peak. With more substantial earthworks, seven times the area could be provided.

2.2.2 Novice Slopes

So far there is only one slope specifically catering for novice skiers which is Happy Valley. It is a long, relatively narrow run with a total area of 1.4 ha. Due to some congestion because of narrowness near the top, a density of 75/ha, which is halfway between the lower Branch/Rowan figure and that for Whakapapa is considered appropriate.

PHOTOGRAPH 3

CORONET PEAK : HALFWAY ON DOUBLE CHAIR (1434 m) TO SUMMIT (1647 m)
9 October 1979 B J Mason

Adequate snow cover persists on upper half of mountain to provide potential for late season skiing. Halfway station could have been used to load skiers using only upper slopes. Access to these slopes available via chair from lower terminal. Skifield closed 9 days previously, but lift operating for sightseers. Halfway beginners' area, with fixed-grip tow on left. By filling the "Elephant's Pit" depression to the right of the tow, an area of 6600 m^2 or 6 times the existing tow serviced area could be made available for beginner skiers. Access could be as foot passengers on chair lift, or by oversnow vehicle. Upper terminal of triple chair on centre skyline.

At this density 100 novice skiers can be accommodated at one time exclusive of those que ing and on the poma lift. There is limited scope for further novice slopes but this would require major earth works. Limited improvement to the Happy Valley slope is feasible by widening the top narrow section.

2.2.3 Low Intermediate and Intermediate Slopes

Coronet Peak's predominant characteristic is its intermediate terrain; 2800 skiers could be distributed over the slopes at any one time, being 75% of the total slope capacity for the whole field. At the undeveloped eastern side of Rocky Gully some 30 ha are suitable for Low Intermediate skiers with a slope capacity of 450.

Overall the scope for Low Intermediate is relatively limited, compared to the vast scope for intermediate skiers. There is excellent lateral spread of intermediate slopes, occupying the full breadth of the lower slopes.

2.2.4 Advanced Slopes

The advanced intermediate to expert slopes generally occupy the upper slopes of the mountain, providing excellent separation from lower ability levels. By greater utilisation of slopes already in use, without expansion to the large Back Basin area, 500 advanced skiers could be accommodated on-slope.

2.3 Current Utilisation

Rogers[12] has recorded that the highest usage to have occurred at Coronet Peak was in 1977 with 121,000 skier days, with a mean of 1827/day during August. On the basis of one vehicle count in August 1976 Rogers estimated that the peak day for the month of August was twice the mean. This is a "persons at one time" (PAOT) measurement of the total number of visitors, both skiing and nonskiing at one time. On the peak day in August 1977, 3650 skiers may have visited Coronet Peak.

The mean for August 1979 was 2620. The relatively late start to the season, caused a disproportionately high figure (83% of total skier days per season, compared to an average of 52% for 1973-78). In the absence of a survey to determine actual visitation, it may be unrealistic to apply the x2 factor. However, if applied, a total of 5200 may have visited on the peak day during the 1979 winter.

2.4 Skier Market Demand

Ideally the balance of slopes available in a district should suit the full range of skier ability levels. Rogers[12] has provided "Apparent Skier Market Proportions" which provide the only available basis for measuring Coronet Peak's potential to meet market demands.

TABLE 4 Coronet Peak : Potential to Meet Skier Market Demand

Skill Classification	'Apparent Skier Market Proportions' %		Slope Capacity Available	Slope Capacity Requirement*	% Availability
Beginner	5		245	182	135
Novice	15		105	545	19
Low Intermediate	27		450	981	46
Intermediate	30		2340	1090	215
Advanced Intermediate	13	)			
Advanced	5	) 23	495	836	59
Expert	5	)			
			3635		

* in relation to total capacity available

Coronet Peak can supply beginners' requirements by full use of the Halfway, Chalet and Rocky Gully slopes without construction of the lower gullies area. Major imbalances occur with novice and low intermediate slopes, with one fifth of novice and one half low intermediate requirements. There are twice the requirements of intermediate and 60% of advanced requirements. This latter deficiency could be overcome by development of the Back Basin area.

This analysis has identified deficiencies in novice and low intermediate terrain at Coronet Peak. However there are few individual skifields which I have visited which provide a balanced range of slopes to suit all ability levels. There are invariably readily apparent imbalances. For example, I have always regarded Coronet Peak predominently as an intermediate

field, Tekapo as novice/low intermediate, Mount Hutt as low intermediate for the area developed to date, and Craigieburn Valley as advanced.

Short of finding or constructing the ideal mountain designed to suit market specifications, the only alternative is to plan towards a regional balance between ski fields so that market demands can, if possible, be satisfied on a regional basis.

The ability of other alternatives in conjunction with Coronet Peak, to meet market requirements is discussed in Sections 3 and 4.

2.5 Design Capacity

The Whakapapa study[3] determined the relationship between the numbers actually skiing the slopes, those on the lifts or in queues, and in carparks or other facilities. It was determined that the "skiers at one time" (SAOT) being those on the slopes, lifts or in queues, is three times those on the slopes.

It has further been found that the PAOT being the total number of people on the mountain either skiing or not skiing is twice the SAOT. A significant factor in public visition to Mount Ruapehu is the large number of nonskiing snow players. This usage is almost nonexistant at Coronet Peak, so the two times factor for calculating the PAOT is too high. A factor of 1.5 is probably closer to the Coronet situation. The SAOT and PAOT are calculated in Table 5.

Table 5 Calculation of Design Capacity: Skiers and People At One Time

Slope Capacity	x3 = SAOT	x1.5 = PAOT
3600	10,800	16,200

The constraints to achievement of full slope utilisation are lift capacity, and supporting facilities such as car parking and service buildings. The present maximum uphill lift capacity of the two chairlifts and three pomas is 4580 skiers per hour. Due to mechanical breakdowns, and misloading, lifts operate at less than their design capacity under peak conditions[3,10]. Also the practice of running the double chair at half speed for winter sightseers reduces Coronet Peak's uphill capacity to approximately 3700 skiers per hour in peak periods.

Discontinuation of this practice and the provision of an over-snow passenger vehicle to transport beginners to and from the Halfway slopes, would substantially increase the chairlifts capacity.

To attain maximum slope utilisation would require approximately a four times increase in lift capacity. In practice this could probably not be achieved. Due to constraints of lift alignment and terrain, it may not be economically attractive to service all available slopes with sufficient uphill capacity to allow optimal skier distribution. However I estimate that Coronet Peak could accommodate more than twice the present lift capacity. Options for increasing lift capacity include:

1. Installation of additional lifts in areas g and f (Plan 1) between the existing lifts
2. Extension of lift development to east of the Blue Gum Poma utilising existing base facilities in Rocky Gully (area g)
3. Development of the extensive "Greengates" slopes above Dirty Four Creek (area e). These slopes are a very uniform gradient (35-40%) and are suitable for one or more surface lifts such as T-bars with 245-305m vertical lift.

Existing car parking is available over an area of approximately 7500m^2. At an allowance of 25m^2 per car, the four car parks at Coronet Peak can accommodate 300 cars with another 50 or more parked on road-sides. At present use levels, the existing car parks appear to be adequate on most occasions.

Field inspections to locate further parking areas, being areas with gradients of less than 1:5 that could be developed down to 1:10 have shown three main areas which could comfortably accommodate all the cars that would result from a PAOT of 2-3 times the 1977 peak.